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SOME PROBLEMS IN THE TITRATION OF STREPTOMYCIN

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AND

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In the titration of an antibiotic substance it has been usual to choose for the test organism a microbe which is very sensitive and which is easy to work with. For streptomycin use has been made of Gram-negative bacilli such as *B. coli* or Friedländer's bacillus, and one strain of Friedländer's bacillus (Klebsiella 41) has been extensively employed in America. In this article we propose to deal with some of the difficulties we have encountered in the titration of streptomycin in solution or in the patient's serum. We might say here that, as we had no official standard solution of streptomycin, we used for these tests a standard solution made up by dissolving in 100 ml. the contents of one bottle of Merck's streptomycin, which was labelled as containing 1 g. of streptomycin hydrochloride.

Influence of the Nature of the Culture Medium

For some time we have been using glucose–phenol-red–serum water for the titration of penicillin in patients' serum. When streptomycin was titrated in this medium we found that we obtained a much higher end-point than when it was titrated in ordinary broth. We therefore made observations on the bacteriostatic power of streptomycin on a number of different organisms in four different media—namely, (*a*) ordinary digest broth; (*b*) peptone water; (*c*) glucose–phenol-red–serum water (this is made by boiling for a few minutes serum, 2 parts; distilled water, 6 parts; 10% glucose solution, 2 parts; and saturated solution of phenol red, sufficient to give a red colour); (*d*) defibrinated human blood, inactivated.

In regard to the first three media serial twofold dilutions of the stock streptomycin were made in the media which had been inoculated with 10 c.mm. per ml. of a 24-hour culture of the test organism. This was done in 0.5 ml. quantities in test-tubes. With broth and peptone water the end-point was the appearance of visible growth after 24 hours. In the serum water there was a colour change from red to yellow, and a precipitation of the medium where the organisms grew and fermented the glucose.

When the test was made in blood the streptomycin was diluted in saline in 25-c.mm. volumes; these were mixed with the same volume of blood which had been suitably infected with the test organism, and incubated in slide cells. As the growth of Friedländer's bacillus in blood is not very obvious 2% glucose was added when testing this organism. When growth then occurred the blood was haemolysed and a good end-point obtained. The results are shown in Table I.

TABLE I.—*Bacteriostatic Power of Streptomycin tested in Different Media*

Test Organism	Lowest Concentration (in Thousands) of Streptomycin Completely Inhibiting Growth in			
	Broth	Peptone Water	Glucose–Phenol-red–Serum Water	Human Blood Inactivated
Haemolytic streptococcus	1/100	No growth	1/2000	1/40
Staphylococcus	1/320	1/1600	1/4000	1/1000
C. diphtheriae	1/600	1/1600	1/4000	1/1000
B. coli (haemolytic) ..	1/40	1/160	1/1000	1/400
Klebsiella 41	1/320	1/500	1/4000	1/1000*
Friedländer 3	1/1500	1/4000	1/10,000	1/1000*

* A good end-point was obtained only when 2% of glucose was added to the blood.

These results show that there is a great difference in the end-point according to the culture medium used. With one exception the lowest readings were obtained in broth, and invariably the highest readings were those in serum water. It is interesting that the results in human blood are usually considerably higher than in broth.

Influence of Dilution of the Culture Medium

In the first experiments streptomycin solution in distilled water was titrated in broth and in a tenfold dilution of this broth in distilled water. The titrations were done in 0.5 ml. quantities in small test-tubes, and the end-point was the appearance of visible growth. The results are shown

TABLE II.—*Effect of Dilution of the Culture Medium with Water in the Titration of Streptomycin*

Test Organism	Least Concentration Completely Inhibiting Growth of Test Organism in Broth	
	Undiluted	Tenfold Diluted
Staphylococcus	1/300,000	1/60,000,000
Haemolytic streptococcus ..	1/200,000	1/1,000,000
C. diphtheriae	1/600,000	1/60,000,000
B. coli	1/80,000	1/1,000,000
Klebsiella 41	1/300,000	1/100,000,000

in Table II. In this titration all the constituents of the broth were diluted. Another titration was done in broth and tenfold-diluted broth, to each of which glucose was added to make 2%. This gave the results shown in Table III. In both these experiments there was an enormous difference in the end-point in the diluted medium.

TABLE III.—*Test Organism, Klebsiella 41. Growth in Dilutions of Streptomycin (in thousands)*

	1/100	1/500	1/2500	1/12,500	1/62,500	Control
Broth + glucose ..	0	+	+	+	+	+
Tenfold-diluted broth + glucose	0	0	0	0	+	+

Meantime other experiments had shown that the salt content of the medium had some influence on the end-point, so titrations were made in broth, and in broth diluted ten times with water and with normal saline. The results are shown in Table IV. This showed that the salt content of the medium made a considerable difference.

TABLE IV.—*Test Organism, Klebsiella 41. Growth in Dilutions of Streptomycin (in thousands)*

	1/100	1/500	1/2500	1/12,500	1/62,500	Control
Broth undiluted	0	+	+	+	+	+
„ diluted in saline ..	0	0	0	+	+	+
„ „ in water ..	0	0	0	0	+	+

We made similar observations using serum water as the culture medium. The original serum water (serum 1 part boiled with 3 parts distilled water) was diluted with water and with saline, and to each was added 1% glucose and phenol red. The results appear in Table V.

TABLE V.—*Growth of Klebsiella 41 in Serum Water diluted with Water and with Saline and containing Streptomycin as Under (in thousands)*

	1/1600	1/3200	1/6400	1/12,800	1/25,600	1/51,200	1/100,000	Control
Serum water undiluted ..	0	0	0	+	+	+	+	+
Serum water diluted 10 times in saline 0·85%	0	0	+	+	+	+	+	+
Serum water diluted 10 times in water	0	0	0	0	0	0	+	+

The original serum-water medium has a much lower salt content than normal saline. (The only salt in it is that of the serum, which is diluted four times in water.) When this was diluted with water the titre of the streptomycin was much higher than in the undiluted serum water, but when it was diluted in normal saline it was slightly lower. When the salt content of undiluted serum water was raised to 0.85% it gave exactly the same end-point as did tenfold-diluted serum water with the same salinity.

These experiments confirm the statement which often appears in streptomycin literature, that the salt content is of considerable importance and that saline solutions to some extent inhibit streptomycin.

Effect of the Size of the Inoculum of the Test Organism

Experiments were made to see whether streptomycin behaves like penicillin, which gives the same end-point whatever the inoculum within quite wide limits, or like sulphanilamide, which is very sensitive to changes in the size of the inoculum. The same batch of medium (glucose–phenol-red–serum water) was divided into 4-ml. volumes which were inoculated with 0.1 ml. of serial dilutions of a broth culture of the test organism (Klebsiella 41). A streptomycin solution 1 in 1,000,000 was titrated with each of these media, with the results shown in Table VI.

TABLE VI

Dilution of Broth Culture used as Inoculum	Growth resulting in Concentrations of Streptomycin (in millions)					
	1/2	1/4	1/8	1/16	1/32	Control
1/1	0	0	+	+	+	+
1/10	0	0	±	+	+	+
1/100	0	0	0	+	+	+
1/1000	0	0	0	+	+	+
1/10,000	0	0	0	0	+	+
1/100,000	0	0	0	0	+	+
1/1,000,000	0	0	0	0	+	+

It will be seen that there is a definite change in the end-point as the inoculum gets smaller. The titration is sensitive enough when the inoculum is considerable, and we have found that when very small inocula are used the results may be irregular. We have therefore used as a routine an inoculum of 10 c.mm. of a 24-hour broth culture to each 1 ml. of the culture medium.

Influence of Atmospheric Conditions

Experiments were conducted to see whether anaerobic conditions influenced the end-point. For the most part these were done in a very simple manner by making serial dilutions in 1-ml. quantities in the infected culture medium and then transferring 0.5 ml. to another set of tubes in which the fluid was covered with a layer of melted petroleum jelly. Thus we had one series of tubes fully exposed to the air and another exactly similar set from which air was excluded. It was found that with some test organisms it required, in the absence of air, a higher concentration of streptomycin to inhibit growth completely.

TABLE VII.—*Influence of Anaerobic Conditions on the Titration of Streptomycin. Test Organism, Klebsiella 41. Medium, Glucose–Phenol-red–Serum Water*

	Growths in Dilutions of Streptomycin Solutions				
	1/8	1/16	1/32	1/64	Contro
Aerobic	0	0	0	+	+
Anaerobic	0	+	+	+	+

The same result was obtained when the anaerobic tube were incubated (without the petroleum jelly covering) in an anaerobic jar.

Incubation in Capillary Tubes.—In the past, when titrating penicillin in a patient's serum, we used small volumes and incubated in capillary tubes the serum dilutions with the test streptococcus and human blood. Later we used the same technique but diluted the serum in glucose–phenol-red–serum water. The capillary tubes were sealed in the flame and incubated horizontally stuck on "plasticine" on a microscope slide. When we adopted this last method with streptomycin, using *B. coli* or Friedländer's bacillus as the test organism, the end-point was often obscured by the fact that in several tubes there was only a partial change of colour—one portion of the tube would be yellow and another red. We found also that the end-point was not the same as it was when the fluids were incubated in open tubes. We therefore compared the results obtained by incubating the same fluids in four different ways: (*a*) in 0.5-ml. quantities in open test-tubes (*b*) in capillary tubes (about 1 in. (2.5 cm.) column of fluid (b1) unsealed and incubated horizontally, (b2) sealed and incubated horizontally, (b3) sealed and incubated vertical

TABLE VIII

Method of Incubation	Dilution of Streptomycin Solution				
	1/8	1/16	1/32	1/64	Control
Test tubes, open	0	0	0	+	+
Capillaries, open, horizontal ..	0	0	0	+	+
" closed, horizontal ..	0	±	+	+	+
" " vertical ..	±	±	+	+	+

The results with open test-tubes and open capillaries were identical, but when the capillaries were sealed (in the flame) it required more streptomycin to inhibit growth and still more when they were incubated vertically. It seems possible that this may, in part at least, be due to the diminished access of air in the closed tube. This result was obtained with *B. coli* and Friedländer's bacillus and staphylococcus, but when streptococcus was used as the test organism the end-point was the same whether the capillaries were open or closed, and whether they were incubated horizontal or upright.

The fact that open capillaries gave what is apparently the true reading is fortunate in that it saves the time which would be occupied in sealing them. The capillaries used were about 4 in. (10 cm.) long and approximately 1 mm. in diameter. When stuck horizontally in plasticine the fluid (unless there is rough handling) remains in place near the middle.

Sensitivity of Different Bacteria to Streptomycin

Many tables have been published giving the amount of streptomycin necessary to inhibit the growth of different bacteria. In a consideration of these figures we must take into account the medium in which the test was made, for, as we have seen, the nature of the culture medium makes a vast difference to the result.

TABLE IX.—*Sensitivity of Bacteria to Streptomycin in Broth and in Glucose-Phenol-red-Serum Water*

	No. of Strain	Lowest Concentration Completely Inhibiting Growth			
		Broth		Serum Water	
		Lowest	Highest	Lowest	Highest
Friedländer's bacillus	5	1/30,000	1/1,500,000	1/2,000,000	1/12,000,000
B. coli	18	1/40,000	1/160,000	1/500,000	1/2,000,000
Ps. pyocyanea ..	5	1/20,000	1/40,000	1/1,000,000	1/4,000,000
B. proteus	6	1/10,000	1/20,000	1/500,000	1/2,000,000
B. typhosus ..	8	1/20,000	1/80,000	1/500,000	1/4,000,000
B. paratyphosus A ..	4	1/20,000	1/40,000	1/1,000,000	1/2,000,000
B. paratyphosus B ..	5	1/20,000	1/40,000	1/500,000	1/1,000,000
B. paratyphosus C ..	1	1/20,000		1/1,000,000	
Other Salmonella ..	6	1/20,000	1/160,000	1/500,000	1/2,000,000
B. dysenteriae ..	4	1/160,000	1/160,000	1/1,000,000	1/1,000,000
Haemolytic streptococcus	1	1/160,000		1/1,000,000	
Streptococcus viridans	7	1/50,000	1/400,000	1/1,000,000	1/6,000,000
Staphylococci ..	2	1/320,000	1/320,000	1/4,000,000	1/4,000,000
H. influenzae (Fildes extract added)	4	1/100,000	1/100,000	1/600,000	1/600,000

In Table IX we set forth the results obtained with a large number of organisms tested in our ordinary nutrient broth and in glucose-serum water. When figures are given as to the effect of streptomycin on bacteria it is quite obvious that the culture medium should be described, and it is also very desirable that a standard organism should be included in the test—such as the staphylococcus, which has been universally used for penicillin titration, or Friedländer's bacillus (Klebsiella 41).

Distribution of Streptomycin in Blood.—Experiments were made to determine the relative amount of streptomycin in the corpuscles and the serum. A citation of one of these will serve.

Streptomycin 1/500,000 was added to serum. This was divided into two parts. One of these was mixed with an equal volume of packed cells which had not previously been in contact with streptomycin. At intervals a sample of the mixture was centrifuged and the streptomycin content of the serum was compared with that of the control serum, to which no cells had been added. After one hour the bulk of the streptomycin remained in the serum and only a relatively small amount had passed into the corpuscles, but after six hours the streptomycin was equally distributed between the serum and the corpuscles.

Testing of a Patient's Serum for Streptomycin.—As with penicillin it is desirable, in order to avoid undue bleeding of the patient, to use a micro-method, and the methods employed for penicillin are applicable to streptomycin, with a possible change of the test organism. Normal sera containing no streptomycin were tested by making dilutions in glucose-phenol-red-serum water infected with *B. coli* or Friedländer's bacillus, and it was found that growth was inhibited in the higher concentrations of serum. Sometimes it was only a 1 in 2 dilution which inhibited, but sometimes as much as 1/32 dilution showed no growth. When the serum was inactivated this bacteriostatic action disappeared. It follows from this that if this organism is used the serum must be inactivated, otherwise it will be impossible to detect small amounts of streptomycin in the serum.

Use of Liquoid for Inactivation.—Inactivation of the serum by heat meant another operation, and we thought that by adding liquoid to the culture medium we might destroy the antibacterial power of the serum. Liquoid in a concentration of 1 in 2,000 did not interfere with the growth of any of the test organisms, and it completely destroyed the antibacterial power of the serum. We thought we had solved this problem until we discovered that liquoid interfered in some way with the action of streptomycin, as is shown in the following experiment (Table X). Different concentrations of liquoid were made in serum-water medium, and solutions of 1 in 200,000 streptomycin in the same concentration of liquoid were titrated in each of these media.

TABLE X

Concentration of Liquoid in Medium	Growth of Staphylococcus in Concentrations of Streptomycin (in thousands)						
	1/400	1/800	1/1600	1/3200	1/6400	1/12,800	Control
1/500	0	+	+	+	+	+	+
1/1000	0	0	±	+	+	+	+
1/2000	0	0	0	±	+	+	+
Control, no liquoid	0	0	0	0	±	+	+

This interference of liquoid with streptomycin made it an unsuitable inactivating agent, and when using a test organism which is inhibited by human serum such serum has to be inactivated by heat before its streptomycin content is estimated. It was found that inactivation of the serum by heat (half an hour at 56° C.) did not destroy the streptomycin.

The method of titrating streptomycin in blood serum which we have finally adopted is as follows:

1. *Culture Medium.*—Serum 1 part, distilled water 4 parts, boiled or steamed with 1% glucose and sufficient of a saturated watery solution of phenol red to give a very definite red colour. For use 1 ml. of this medium is inoculated with 10 ml. of a 24-hour broth culture of the test organism.

2. *Test Organism.*—The Friedländer's bacillus (Klebsiella 41) which has been in use in America is very suitable, but if this is employed the patient's serum must be inactivated by heat before the test. Staphylococcus may be used (choosing a strain which is not inhibited by human serum). It is almost as sensitive as Klebsiella 41 and there is no need to inactivate the serum. If the patient has had penicillin, staphylococcus cannot be used unless penicillinase is added to the medium.

3. Serial dilutions of the serum to be tested are made in normal saline solution, and to each of these dilutions is added an equal volume of the infected medium. We have preferred to use .025-ml. volumes and carry out the incubation in capillary tubes *open at both ends* and stuck flat on plasticine on a microscope slide, but the test can be done in exactly the same way using larger volumes and incubating the mixtures in small test-tubes. When serum water is used as the medium for titration and Klebsiella 41 or staphylococcus as the test organism the end-point comes at a dilution of 1 in 4–6 million. In blood it requires about 1 in 1 million concentration of streptomycin to inhibit growth completely, so that this method will indicate a smaller amount of streptomycin than the therapeutic level, whereas if broth is used this would not be so. Serum water is also more suitable for the test as it is an unbuffered medium and the end-point is more easily read than it is in broth.

4. *Control.*—As the final end-point of the titrations depends on so many factors it is necessary to make a control titration of a known concentration of streptomycin (1 in 1,000,000) in human serum. A comparison of the end-point obtained with this and with the patient's serum will give an absolute measurement of the streptomycin content in the latter.

The accompanying Chart illustrates the result obtained by titrations of patients' serum following intramuscular

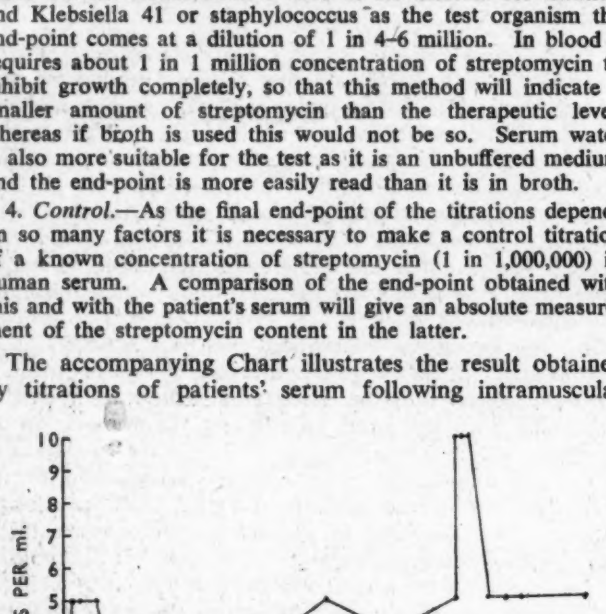

Chart showing the streptomycin content of a patient's serum after intramuscular injections of 0.33 g. of the drug. The arrows represent time of injections.

injections of 0.33 g. of streptomycin. Injections were given every four hours except that at bedtime that amount was doubled (indicated on the chart by a thick arrow), and eight hours elapsed before the next injection. The blood was tested just before each injection and at shorter intervals after the first and the sixth injections. It will be seen that at the end of the first injection interval there were still 2 units per ml. in the serum, but after three injections the residual amount was maintained at 4 to 5 units.

ADDENDUM

Error in making Serial Dilutions with a Capillary Pipette

The usual method is to lay out on a paraffined slide a number of equal volumes from a graduated capillary pipette. None of these is the whole volume represented by the graduation; all of them are that volume less the wash of fluid which wets the inside of the pipette. This varies with the bore of the pipette and with the rate of expulsion, but Fleming (1924) estimated that with ordinary capillary pipettes and at the normal rate of working the wash amounted to about 3%.

The fluid to be diluted is taken up to the graduation mark in the pipette, expelled into the first drop of the diluent, and then mixed by sucking up and expelling the fluid several times. This means that the whole of the fluid to be diluted is mixed with the same volume of the diluent minus the "wash." Then one volume of this mixture is taken with the same pipette and mixed in the same way with the second drop of diluent. But the pipette in making the first mixture has been wetted up to the second graduation mark, so that in making the second dilution the whole volume plus an additional wash is mixed with the volume minus a wash. This is an error accumulating with each of the serial dilutions, and while it is small with a short series it becomes serious when ten or more serial dilutions are made in this way. The extent of the error may be seen in the following experiment.

Dilutions of streptomycin were made accurately 1/10,000, 1/50,000, 1/1,000,000, and 1,/5,000,000. These were titrated by twofold dilutions in glucose–phenol-red–serum water infected with Friedländer 3. With 1/10,000 strength 14 serial dilutions were made before an end-point was reached. Complete inhibition of growth occurred in what purported to be 1 in 80,000,000 and growth occurred in 1 in 160,000,000. With the 1 in 50,000 strength 11 serial dilutions gave an end-point of inhibition in 1/50,000,000 and growth in 1/100,000,000. With the 1/1,000,000 strength 5 dilutions showed inhibition in 1/16,000,000 and growth in 1/32,000,000. With the 1 in 5,000,000 strength 2 dilutions showed inhibition in 1/10,000,000 and growth in 1/20,000,000. A control series done by a method which eliminates the wash gave the same result as the last.

It is quite evident, therefore, that a *long* series of twofold dilutions made in the usual way by a method in which there is the cumulative error of the wash may give results which are wide of the mark. It is suggested that the series of dilutions made in this way should not exceed 5 or 6.

Fleming (1924) has suggested a method whereby dilutions can be made with capillary pipettes, which avoids the error of the wash and can be adapted to the titration of streptomycin or other substance.

Summary

In the titration of streptomycin the end-point depends on (1) culture medium, (2) atmospheric conditions, (3) nature of the test organism, and (4) size of inoculum of the test organism.

Results are given for many organisms in broth and serum water.

A method of titration of streptomycin in patients' serum is described.

Attention is drawn to an error inherent in the method of serial dilutions by capillary tubes.

REFERENCE

Fleming, A. (1924). *Brit. J. exp. Path.*, 5, 148.

The Royal Sanitary Institute will hold its 1947 health congress at Torquay, from June 2 to 6, at the invitation of the Corporation. The Earl Fortescue, Lord Lieutenant of the County of Devon, will be President of the Congress. The following is a selection from the provisional programme: June 2, 3 p.m., official welcome by the Mayor of Torquay and inaugural address by the president of the congress. June 3, 10 a.m., Section of Preventive Medicine, discussions on "The Scope of Public Health after 1948" and "The Present Position and Prospects in Whooping-cough Immunization"; Section of Engineering and Architecture, discussions on "The Design and Location of Health Centres" and "Engineering Standards in Relation to Health"; Sanitary Inspectors conference, discussions on "The Social Aspect of the Housing Problem" and "Milk: A Food for Thought." June 4, 10 a.m., Medical Officers of Health conference, discussion on "The National Health Service Act and the Public Health Service." Health Visitors conference, discussion on "The Expanding Duties of the Family Health Team." June 5, 10 a.m., Section of Maternal and Child Health, discussion on "Infantile Mortality: the Clinical Aspects"; Section of Tropical Hygiene, discussion on "The Practical Application of Recent Advances in Tropical Medicine and Hygiene to Rural Tropical Areas, (*a*) Anopheles (Malaria) Eradication in Karpas, Cyprus, 1946, and (*b*) Native Welfare in its Wider Aspects, including Nutrition and Housing." June 6, 10 a.m., Section of Maternal and Child Health, discussion on "Infantile Mortality: The Preventive Aspects"; Section of Veterinary Hygiene, discussion on "The Importance of Cowshed Hygiene in the Transmission of Milk-borne Diseases"; Section of Food and Nutrition, in conjunction with the Food Group of the Society of Chemical Industry, discussion on "The Microbiological Aspects of Food Quality."

THE PHYSICAL HEALTH OF CHILDREN ATTENDING DAY NURSERIES

A REPORT TO THE DAY NURSERIES COMMITTEE OF THE MEDICAL WOMEN'S FEDERATION

BY

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PART II

6. Postural and Foot Conditions

Comparison was made between the home and nursery groups of the incidence of poor posture, genu valgum, and pes valgus in children over 2 years of age. Under 2 years a comparison was felt to be useless owing to the normal variation in time of walking and of development of the arches of the foot. (*a*) *Poor posture* included lordosis, round shoulders, stooping, and hyperextension or sagging of the knees on standing; (*b*) *Genu valgum* was recorded where the gap between the internal malleoli was over 1/2 in. (1.25 cm.) in the supine position; (*c*) *Pes valgus* included not only advanced flat foot but also those cases where the child habitually walked and stood on the inner border of the foot.

Results (*Tables VIII, IX, X*).—*Poor Posture.*—A slightly higher incidence was recorded in the nursery group for all ages together (2–5) and in individual age groups, but no difference was significant except in boys of 2–5 years. *Genu valgum.*—At all ages together 2–5), and in all individual age groups, there was a slightly higher incidence in the nurseries, except among boys of 2–3 years, where the home group had a slightly higher rate. No differences were statistically significant except in girls of 2–3 years, where the nursery rate was significantly higher. *Pes valgus.*—The nursery rate was higher throughout, and all differences were significant except among girls and boys of 4–5 years. Pes valgus was about two and a half times more frequent among nursery boys and three times more frequent among nursery girls than in the corresponding home groups.

TABLE VIII.—*Percentage of Examinations where Poor Posture was found*

Age		Boys	Girls
2–3 years	Nursery	4·2	7·4
	Home	4·2	4·9
	Difference	0 ± 2·1	2·5 ± 2·5
3–4 „	Nursery	16·3	17·0
	Home	11·2	14·4
	Difference	5·1 ± 4·0	2·6 ± 3·9
4–5 „	Nursery	32·4	18·5
	Home	28·8	14·8
	Difference	3·6 ± 6·2	3·7 ± 4·6
2–5 years	Nursery	16·9	13·6
	Home	11·9	11·0
	Difference	5·0 ± 2·4*	2·6 ± 2·1

* Significant difference.

TABLE IX.—*Percentage of Examinations where Genu Valgum was found*

Age		Boys	Girls
2–3 years	Nursery	7·4	14·4
	Home	9·7	7·4
	Difference	−2·3 ± 2·9	7·0 ± 3·3*
3–4 „	Nursery	27·2	21·1
	Home	19·2	12·0
	Difference	8·0 ± 4·9	9·1 ± 4·0
4–5 „	Nursery	22·6	12·6
	Home	21·3	12·2
	Difference	1·3 ± 5·6	0·4 ± 4·1
2–5 years	Nursery	18·6	13·6
	Home	15·4	10·3
	Difference	3·2 ± 2·5	3·3 ± 2·1

* Significant difference.

TABLE X.—*Percentage of Examinations where Pes Valgus was found*

Age		Boys	Girls
2–3 years	Nursery	13·9	12·1
	Home	5·5	5·6
	Difference	8·4 ± 3·1*	6·5 ± 3·0*
3–4 „	Nursery	16·8	11·3
	Home	7·2	1·2
	Difference	9·6 ± 3·9*	10·1 ± 2·6*
4–5 „	Nursery	10·3	1·3
	Home	5·0	0
	Difference	5·3 ± 3·8	1·3
2–5 „	Nursery	13·7	8·9
	Home	5·9	2·5
	Difference	7·8 ± 2·1*	6·4 ± 1·5*

* Significant differences.

7. Comparison of Weights

Table XI compares the average mean weight of the nursery and home children for every 3-monthly age group from 0 to 5 years of age. The results for boys and girls are given separately.

TABLE XI.—*Mean Weights in Pounds (1 lb.=454 g.)*

Age in Months	Nurseries No.	Nurseries Mean	Home Group No.	Home Group Mean	Differences (N–H)
Boys					
0– 3	1	10·8	6	12·0	−1·2
3– 6	20	13·4	23	14·8	−1·4 ± 0·85
6– 9	24	17·2	33	18·5	−1·3 ± 0·57*
9–12	46	20·1	44	21·8	−1·7 ± 0·50*
12–15	40	22·0	53	23·1	−1·1 ± 0·67
15–18	50	23·0	63	24·6	−1·6 ± 0·45*
18–21	40	24·8	66	26·1	−1·3 ± 0·48*
21–24	43	26·7	52	27·2	−0·5 ± 0·54
24–27	47	28·1	44	27·6	0·5 ± 0·58
27–30	50	30·4	43	28·4	2·0 ± 0·66*
30–33	49	31·4	33	29·0	2·4 ± 0·72*
33–36	44	32·1	31	30·1	2·0 ± 0·69*
36–39	36	31·8	27	30·5	1·3 ± 0·86
39–42	34	32·8	35	32·0	0·8 ± 0·80
42–45	45	34·2	34	32·9	1·3 ± 0·92
45–48	45	35·6	30	34·8	0·8 ± 0·91
48–51	32	36·4	22	36·1	0·3 ± 1·1
51–54	34	37·2	28	36·6	0·6 ± 0·85
54–57	44	37·3	26	36·6	0·7 ± 0·62
57–60	42	38·4	11	37·6	0·8
Girls					
0– 3	2	11·1	2	9·7	2·4
3– 6	22	12·6	30	15·0	−2·4 ± 0·50*
6– 9	22	15·9	50	17·9	−2·0 ± 0·71*
9–12	48	18·4	55	20·4	−2·0 ± 0·50*
12–15	42	20·5	45	23·0	−2·5 ± 0·60*
15–18	52	22·5	51	22·8	−0·3 ± 0·48
18–21	66	24·2	63	24·1	0·1 ± 0·45
21–24	53	25·1	60	25·4	−0·3 ± 0·53
24–27	53	26·7	47	26·3	0·4 ± 0·67
27–30	43	28·3	41	28·3	0·0 ± 0·76
30–33	56	29·3	37	28·9	0·4 ± 0·73
33–36	51	30·1	46	30·3	−0·2 ± 0·65
36–39	37	31·5	38	30·4	1·1 ± 0·81
39–42	39	32·2	44	31·4	0·8 ± 0·72
42–45	41	33·4	39	32·7	0·7 ± 0·86
45–48	55	34·4	39	33·6	0·8 ± 0·53
48–51	39	35·3	27	34·9	0·4 ± 0·89
51–54	40	36·7	33	35·7	1·0 ± 0·73
54–57	32	37·2	33	36·4	0·8 ± 0·97
57–60	26	37·8	18	35·6	2·2

* Significant differences.

Results.—(*a*) *Boys.*—The mean weight of boys in the home group was greater than in the nursery group up to 2 years old, the difference being significant in four out of seven groups. Over 2 years the nursery boys had a greater mean weight in every age group, the difference being significant in three out of 12 groups (between 2 and 3 years). (*b*) *Girls.*—Among the girls under 2 years the mean weight was greater in the home group in six out of eight age groups, the difference being significant in four of these groups (all under 18 months). Over 2 years the nursery girls had a greater mean weight in 11 out of 12 age groups, the differences not being significant in any age group.

The children in the nursery group therefore were on an average lighter under 2 years and heavier over 2 years than those in the home group. The nursery children

gained weight more rapidly between 1½ and 3 years, but up to 1½ years and over 3 years the rate of weight gain was closely similar in both groups.

Sex Differences

At all ages over 6 months in both groups the boys showed a slightly greater mean weight than the girls. The general condition of boys was also on the whole very slightly better than that of girls, though this was not found in every age group. This finding was the same for nursery and home groups. In every other physical finding relating to tonsils, cervical glands, respiratory infections, and postural conditions in both groups the girls had a slightly better record. The difference between boys and girls was not more marked in one group than in the other.

Seasonal Variations in Physical Condition

The seasonal variations in physical condition were closely similar in nursery and home groups, but throughout the year the incidence of all cervical gland enlargements, of tonsillar enlargement, and of chronic nasopharyngeal infections was about 2 to 4 times greater in the nursery group.

Incidence of Specific Infectious Fevers

At each examination a full history was taken of any infection contracted since the previous examination of that child. Only definite accounts of infections were recorded, doubtful instances where evidence was insufficient being excluded. It is probable, therefore, that the figures given below represent somewhat less than the actual total occurrence. Accounts of "diarrhoea," "pneumonia," and certain other infections have been omitted, since these terms cover such a wide range of variable illnesses. In the case of pneumonia particularly, the early use of sulphonamides has made it unlikely that a record of pneumonia on hearsay account would be reliable. For similar reasons accounts of infections of the respiratory tract have been excluded, unless seen also at the time of examination. The incidence of measles, pertussis, varicella, and mumps has been compared, and of these only measles developed often enough for a detailed study of the incidence.

It will be clear that the total incidence of infectious diseases refers to a period of rather less than 11 months, since no account could be taken of infections occurring at the extreme beginning or end of the survey, before a child's first visit or after the last visit. Likewise the figures are based only on those children attending more than once —432 in the nursery group and 409 in the home group.

(*a*) *The total incidence of varicella, mumps, and pertussis* (Table XII) was very low in both groups, varicella and

TABLE XII.—*Total Incidence of Infectious Fevers during Survey (November–October)*

	No. under Observation	Measles	Pertussis	Varicella	Mumps
Nursery group ..	432	111	11	14	9
Home group ..	409	33	18	7	2

mumps being slightly more numerous in the nursery group and pertussis in the home group. Over 80% of the children in both groups gave no history of a previous attack of any of these three fevers. Some children in the nursery group had received prophylactic injections against pertussis: this was extremely rare in the home group.

(*b*) *Measles* (Tables XIII and XIV).—Measles was present in epidemic form in Birmingham during the winter period of the investigation.

1. *The total recorded incidence of measles* in the nursery group during the survey was 111 out of 432 children. This

TABLE XIII.—*Percentage Incidence of Measles (All recorded cases during survey)*

Measles	No. under Observation	Previous Attack		Presumed Susceptibles		Total Incidence of Measles	Incidence in Total Population	Incidence among Presumed Susceptibles
		No.	%	No.	%		%	%
Nursery group	432	158	36·6	274	63·4	111	25·7	40·5
Home group	409	81	19·8	328	80·2	33	8·1	10·0
Differences ..		16·8 ± 3·1*		16·8 ± 3·1*			17·6 ± 8·2*	30·5 ± 3·4*

* Significant differences.

TABLE XIV.—*Age Distribution of Measles (Percentage distribution of all cases recorded during survey)*

		All Ages 0–5 yrs.	Under 18 mths.	18 mths. –3 yrs.	3–5 yrs.
	(a) Age Distribution based on Total Population Observe				
Nursery group	No. under observation ..	432	123	152	157
	Cases of measles	111	36	45	30
	% developing measles ..	25·7%	29·2%	29·6%	19·2%
Home group	No. under observation ..	409	148	150	111
	Cases of measles	33	7	17	9
	% developing measles ..	8·1%	4·7%	11·3%	8·1%
	(b) Age Distribution based on "Presumed Susceptibles" only				
Nursery group	No. of presumed susceptibles	274	107	94	73
	Cases of measles	111	36	45	30
	% developing measles ..	40·5%	33·6%	47·9%	41·0%
Home group	No. of presumed susceptibles	328	139	120	69
	Cases of measles	33	7	17	9
	% developing measles ..	10·0%	5·0%	14·2%	13·0%

was considerably higher than in the home group—33 out of 409—the difference being statistically significant. The percentage incidence during the period was 25.7 in the nursery group and 8.1 in the home group. There was a marked difference in the percentage of those who had already had measles, the proportion being significantly higher in the nursery group. These may be termed "presumably immune," and the others who had not had measles before the survey began may be termed "presumably susceptible." The presumably susceptible were 63.4% in the nursery group and 80.2% in the home group. If the total incidence be expressed as a percentage of the presumed susceptible, then 40.5% developed measles in the nursery group during the survey compared with 10% in the home group. These differences are statistically significant and are striking. The closer daily contact of children in nurseries naturally encourages greater spread of infection, and probably accounts in large measure for this difference in incidence.

2. *The Age Distribution of Measles.*—At all ages (0–5 years) the recorded percentage incidence of measles was markedly higher in the nurseries group than in the home group. Among all children from 0–18 months old the percentage incidence of measles was more than 6 times greater in the nurseries group than in the home group. Between 18 months and 3 years of age and between 3 and 5 years the percentage incidence of measles was about two and a half times heavier in the nursery group than in the home group. In the nurseries group the percentage of children under 18 months old who developed measles during the survey (29.2%) was greater than the percentage incidence for all ages (25.7%); whereas in the home group the percentage of children under 18 months old who developed measles during the survey (4.7%) was little over half the percentage incidence for all ages (8.1%). Among those children who had no previous history of an attack of measles—the "presumed susceptibles" in each group—the proportion who developed measles during the survey in the nurseries group was 40.5% and in the home group only 10%, for all ages (0–5 years). Of those under 18 months old, 33.6% of the presumed susceptibles in the nurseries group developed measles during the survey, compared with 5% in the home group. These results show that the higher incidence of measles in the nursery group affected children of all ages up to 5 years, but especially those under 18 months old. Thus the nursery children not only were much more likely to develop measles but tended to develop it at an earlier age than the home

children. This is particularly important in view of the greater mortality rate of measles in young infants and the greater risk of serious complications.

3. *Seasonal Variations.*—In each of the six winter months of the survey (November–April) an average of 8.9% of the mean population under observation per month developed measles in the nursery group, compared with 2.5% in the home group. In the six summer months (May to October), the incidence of measles per month in the nursery group was 0.05% of the mean population under observation in each month, compared with 0.2% in the home group. Thus measles was more evenly spread over the year in the home group, whereas the nursery group had a higher epidemic incidence in the winter, followed by a very low summer rate—a noteworthy difference when the increased mortality rate of measles during epidemics is considered.

Conclusions and Discussion

The main results of the survey may be summarized as follows:

1. *The average weight of children* under 2 years of age attending day nurseries was consistently less than that of the children living in their own homes, but from 2 years onwards the average weight of nursery children increased more rapidly and finally exceeded that of the home group of children.

2. *The general condition,* as recorded from the clinical impression, was inferior in nursery children under 2 years old to that of children of the same age living in their own homes.

3. *The incidence of respiratory tract infections,* including acute and subacute infections present at examination and chronic conditions such as mouth-breathing and chronic tonsillar and cervical gland enlargements, was from two to eight times greater in the nursery children than among those living at home. This excess was manifest at all ages and in every season.

4. *A significantly higher incidence of specific infectious fevers* occurred in the nursery group, and the epidemic occurrence of measles was more marked than in the home group. Among those children "presumed susceptible" in the nursery group, the incidence of measles was four times greater than in those "presumed susceptible" in the home group.

5. *Poor posture, genu valgum, and pes valgus* occurred more often in the nursery group than in the home group.

Before conclusions are drawn from the above findings it must be stated that this survey was confined to an investigation only of the physical health of the children, and no attempt has been made to assess the effect of nursery life on the child's psychological development or well-being.

The above findings are closely similar as regards respiratory tract infections and weights to those of the recent report of the Day Nurseries Committee of the Medical Women's Federation on the health of children in day nurseries. That report was based on the results of a single restricted examination of a large number of children (4,587) by many workers in many parts of the country, thus attaining a "cross-section" result; whereas the results of the present survey have been obtained by repeated, more detailed examinations over a period of one year by a single worker of a small group of children (1,198) in a single town, and these results include also data on specific infections, fevers, postural conditions, etc.

In the report referred to above the physical condition of children seen within one week of admission to a nursery was assessed separately, in order to determine whether there were any significant physical differences between welfare-centre children and nursery children at the start of nursery life. Statistical interpretation of these findings showed that the high rate of respiratory tract infections in day-nursery children could not be accounted for on these grounds. The inference that there were no significant physical differences at the start of nursery life between day-nursery children and those living at home may reasonably be assumed to apply also to the present survey.

Only Ministry of Health wartime day nurseries were included in this survey; comparable results would, however, be likely in any similar aggregation of young children such as in nursery schools and classes, though it must be remembered that children of the youngest age groups do not attend nursery schools.

It was hoped to include in this survey a comparison of the incidence of infections in those nurseries housed in adapted private or other dwellings and those in specially constructed one-story buildings, the children of which spent a considerable amount of time out of doors. However, the numbers available for comparison between these two types of nurseries in similar social and economic areas were too small to be of statistical value. Conflicting opinions exist on this point, but the impression gained during the survey was that in the one-story "Maycrete"-type of nursery buildings there was a lower incidence of respiratory and other epidemic infections, associated probably with the free ventilation and the extra time spent by the children in the open air.

The superiority in weight of the older day-nursery children over the home group may be correlated with the more generous diet available to them under wartime arrangements. In this survey the nursery children under 1½ years showed a rise in average weight equal to that in the home group, and a more rapid rise in average weight than the home group from 1½ years of age. This more rapid rise in the nursery group continued until 3 years, and after this the rate of weight gain was practically the same in each group, with the nursery group having a higher average weight than the home group, although under 1½ years it had been lower. Nursery children were in fact gaining weight more rapidly from the age of 1½ years. This is roughly equivalent to the time at which the more liberal diet available to children attending day nurseries might be expected to begin to take effect. The improvement in general condition as recorded from clinical impressions followed a similar pattern, though differences between the older nursery and the home children were not statistically significant. It would be interesting to study the effect on both weight and general condition of allowing a similar extra amount of rationed food to children living in their own homes.

The increased weight and better physique of the older day-nursery children did not apparently influence their liability to infections of the respiratory tract. The findings in this investigation endorse the view that when children under 5 years of age are congregated together indoors for long periods a great increase in respiratory and other infections will occur, in spite of careful measures taken in the management of the day nurseries to minimize the spread of infection. It is realized, of course, that wartime staff shortages and use of adapted premises have created difficulties, and that under ideal conditions with generous staffing with trained personnel and ideal buildings the infection rate might be considerably less; but these conditions are not likely to be achieved on a large scale.

The signs of fatigue noted in the nursery group in the higher incidence of pes valgus may be associated with the long hours kept by the nursery children, who were frequently and inevitably up for 13 to 14 hours daily while their mothers were on full-time work. These long hours were a special feature of an emergency period and should not continue.

The much higher incidence of respiratory and other infections and the increased liability to epidemic infections which, according to the evidence, is associated with nursery

life must be an important factor when a large-scale future provision of day nurseries is considered. Short of ideal conditions (and the economic possibility of attaining these is remote), a large amount of respiratory infection, with the usual aftermath of ill-health and complications, may be expected, and must be balanced against the possible advantages of communal life for young children. The possibility exists that the risk of respiratory infections might be reduced considerably by part-time attendance at day nurseries, and the incidence of respiratory infections in children attending nurseries for two or three half-days a week is a question worthy of investigation.

Reference must be made to other work on this subject published since this survey was begun. The report by the Day Nurseries Committee of the Medical Women's Federation (1946) on the health of children in day nurseries revealed a higher rate of respiratory infections in children attending day nurseries than in those living at home, and showed evidence that "for children under 2 years old nursery life had an adverse effect on physical health."

In a study of infections in wartime day nurseries in Oxford (Allen-Williams, 1945) routine health records of children in day nurseries and attending welfare centres were analysed, and it was deduced that there was a greater liability to infections among nursery children, and that these infections occurred at an earlier age, than among children living at home. The records of infections and other details were, however, admittedly incomplete.

A study of the progress of children under 2 years of age in day nurseries in Leyton (Menzies, 1946) concluded that "a substantial proportion of children under 2 years old do not make satisfactory progress on admission to a nursery, as judged by the weight gain . . .", in spite of the very liberal diet in the nurseries, and drew attention to the importance of including in a survey of the health of children in day nurseries those who leave after a relatively short time of attendance because of "fretting" or contracting an infection.

Summary

An investigation in the health of children attending wartime day nurseries was carried out in Birmingham in 1944–5. During a period of one year repeated examinations were made by a single examiner of 557 children attending day nurseries and of a control group of 641 children living at home.

The results are based on a total of 3,250 examinations of children from 0–5 years old.

1. Respiratory tract infections were from two to eight times more frequent among nursery children than among the home group. This excess was manifest at all ages and at every season.

2. The incidence of measles was significantly higher in the day-nursery group, and was four times greater among those presumed susceptible in the day nurseries than in the home group. This excess was marked at all ages, but affected particularly those under 18 months old. The epidemic occurrence of measles was more pronounced in the nursery group than in the home group. These findings are important in view of the increased mortality from measles under 18 months of age and during an epidemic.

3. Pes valgus was more than twice as common among day-nursery children as in those living at home. The significance of this as a sign of fatigue is discussed.

4. Children over 2 years of age attending day nurseries were heavier than the children living at home, and they gained weight more rapidly between 1½ and 3 years of age. This may be correlated with the extra allowances of rationed foods (meat, bacon, cheese, eggs, etc.) available under the rationing system to children in day nurseries.

This investigation was made possible through the generosity of a donor who wishes to remain anonymous. Grateful acknowledgments are made to Dr. W. J. Martin for his statistical assistance, and to Dr. Newsholme and Dr. Jean Mackintosh, of Birmingham Public Health Department, for kindly providing facilities for the survey. Lastly, many thanks are due to the staffs of the nurseries and welfare centres, for whom this survey involved much extra work, for their enthusiastic help and co-operation throughout.

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DE MORGAN'S SPOTS

BY

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The minute round ruby-coloured macules known as De Morgan's spots are of common occurrence in adults. They are most often seen in the skin of the abdominal wall. They vary in size up to a diameter of about 5 mm. and in number up to 20 or occasionally more. Microscopically they have the character of simple haemangiomata.

The spots are named after Campbell De Morgan, surgeon to the Middlesex Hospital from 1842 to 1875. Tradition holds that De Morgan believed the spots to indicate or presage malignant disease, particularly of the stomach. If this was his view he did not (so far as we have been able to discover) commit it to paper. In his book *On the Origin of Cancer* (1872) he does indeed mention the spots, but only as the merest aside. In the course of developing the argument that cancer is not due to an infective agent he says (p. 16): "I have noticed, and it has been verified by the observation of others, that concurrently with, or following on, the development of cancer, small outgrowths of warty or vascular or dermoid structure are frequent. Now one would imagine that, if there were a cancer-poison in the blood, these or one of them would become the seat of the disease. But . . ." And he makes no further reference to the spots which are now known by his name.

The literature on the ruby spots is extremely meagre, and the only paper of note is Sampson Handley's in 1909. He points out that the spots are found in atrophic skin, and begin as small nodules of connective tissue under the epidermis. As the spots enlarge, wide blood channels make their appearance and by their bulk elevate the epidermis, causing further atrophy. He draws attention to the common belief that the spots occur more often in patients affected with cancer, but emphasizes that this belief lacks corroboration. From this brief review of previous work it will be clear that, although the ruby spots by virtue of their brilliant appearance often arouse comment and keen though transitory interest, there is an entire absence of precise information on their significance. Accordingly, it seemed to us useful to collect data over a series of cases large enough to demonstrate their frequency and incidence.

Frequency and Incidence of Spots

Method of Investigation.—The greater part of this paper is based on observations made on 1,300 patients at three Glasgow hospitals—the Western Infirmary, Stobhill Hospital, and the Radium Institute. The routine adopted was to visit in turn each of the general medical and surgical wards and to make observations on every patient available for examination. The area of skin examined for spots extended from the nipple line to the pubis, and laterally as far as the mid-axillary lines. This area was chosen for

convenience and because it is much the commonest site of the spots. For each patient a record card was prepared giving the age, sex, and provisional diagnosis, as well as information about the spots. The spots were classified into groups according to their diameter (as measured by a simple celluloid template), and the number of spots in each size group was noted.

The observations here presented were made in 1944, during our term of office as house-surgeons in the Western Infirmary, Glasgow. Since then one of us has been able to observe at routine medical inspections a large number of healthy men and women of the R.A.F. and W.A.A.F., and the opportunity has been taken of recording (though in less detail) the presence or absence of ruby spots. These observations are contrasted with those made in hospital. It has to be stated explicitly that none of the patients or Service personnel was chosen for record because of the presence or absence of ruby spots.

Influence of Age on Incidence.—Since, as Sampson Handley pointed out, the spots rarely occur before middle life, it is clear that an apparently high incidence of spots in patients with cancer (who are nearly all elderly) might well be fallacious. Accordingly, before proceeding to other considerations it is necessary to determine the relationship of age to the incidence of spots. In Fig. 1 we have included all Glasgow patients, male and female, cancerous and non-cancerous, and analysed the figures according to the number of patients with spots in each age group. It will be seen that the proportion of patients with spots rises progressively with age, at all events up to the age of 70. Thus in adolescence some 5% of patients have spots, but thereafter the proportion increases throughout adult life till in old age about 75% have spots. It is thus quite clear that the number of patients with spots in any series will vary greatly with the ages of the patients considered, and it will therefore be essential to make comparisons at each age group separately when comparing one series with another.

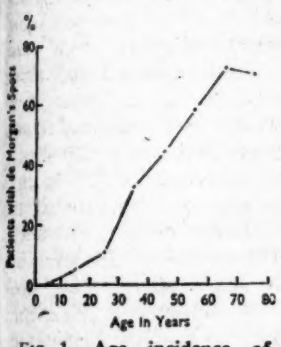

FIG. 1.—Age incidence of De Morgan's spots (three hospitals; both sexes).

Frequency in Hospital Patients as Compared with Air Force Personnel.—A comparison of the frequency of spots in hospital patients and in Air Force personnel is shown in Fig. 2. It will be seen at a glance that, age for age, the proportion of individuals with spots among the Air Force personnel was much less than among the patients. Analysis confirms that the discrepancy is too great to be readily attributed to chance, and some other explanation must be sought. What the explanation may be is open to speculation, for the two series differ in many respects—in race, in health, in sex composition, and doubtless in other ways. It should be noted that the Air Force personnel were in the main English, whereas the patients were drawn from the West of Scotland: the possibility of a racial difference in the incidence of spots is attractive and merits further study. On the other hand, we are inclined to think that differences in sex composition and in health are probably not important. The evidence on which we base this opinion is given below.

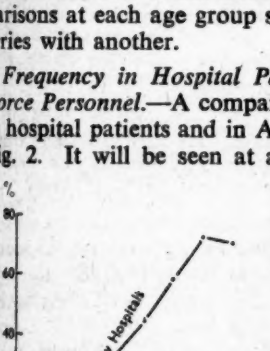

FIG. 2.—Incidence of De Morgan's spots in hospital patients and Air Force personnel.

Sex incidence.—For the purpose of discovering if there was any sex difference in the incidence of ruby spots, we combined all patients from the Western Infirmary and Stobhill Hospital, and classified them (irrespective of disease) according to sex and the presence or absence of spots. It will be seen from Fig. 3 that the frequency of patients with spots (age for age) is almost the same in males and females, and analysis confirms that any small differences are readily attributable to the chances of sampling.

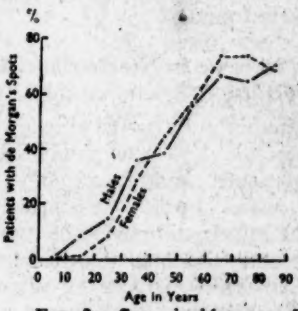

FIG. 3.—Sex incidence of De Morgan's spots (two hospitals; all diseases).

Influence of Disease on Incidence of Spots

In order to find out if there was any such influence we divided our patients into three broad categories: *Group 1:* patients without systemic disease (e.g., fracture cases) and those with acute disease (e.g., pneumonia). *Group 2:* patients with chronic disease (e.g., tuberculosis). *Group 3:* patients with malignant disease. A comparison of the incidence of ruby spots in "acute disease" and in "chronic disease" was made by combining the patients from the Western Infirmary and Stobhill Hospital (irrespective of sex) and classifying them according to the presence or absence of spots. It will be seen from Fig. 4 that the frequency is almost the same; analysis confirms that the small discrepancies are readily attributable to the chances of sampling.

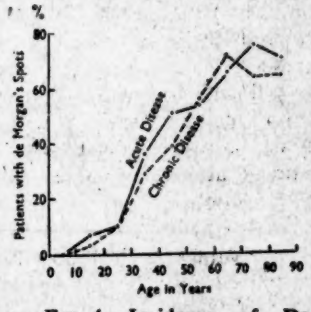

FIG. 4.—Incidence of De Morgan's spots in acute and chronic disease (two hospitals; both sexes).

A comparison of the incidence of ruby spots in malignant disease as against the incidence in all other diseases combined was made by pooling all patients (irrespective of sex) from the three hospitals and classifying them according to the presence or absence of spots. Fig. 5 shows that in malignant disease the frequency of patients with spots was a little higher than that in non-malignant disease at all ages. It should, however, be noted that the differences are small, except at age 31–40 years (where the group of malignant cases comprises only 15 patients). Indeed, analysis reveals that a total discrepancy of the magnitude found might be expected to arise through the chances of sampling about once in eight such experiments, and the differences found cannot therefore be regarded as important. The very fact that a series consisting of 160 malignant and 784 non-malignant cases is insufficient to establish a significant difference in the incidence of ruby spots indicates clearly that the presence or absence of spots has no diagnostic importance.

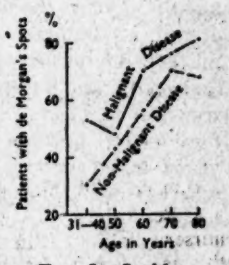

FIG. 5.—Incidence of De Morgan's spots in malignant and non-malignant disease (Western Infirmary, Stobhill Hospital, and Radium Institute; sexes combined).

The somewhat unlikely possibility that cancerous patients might have spots which were unusually numerous or unusually large was investigated by comparing the malignant and non-malignant series, and no significant differences were found.

Increase in Number and Size of Ruby Spots with Age

Hitherto we have restricted attention to the question whether ruby spots were present or absent. It remains to describe how they increase in number and size as age advances, and to attempt an estimate of their rate of growth. For this purpose it has seemed best to pool all the information available from the three Glasgow hospitals. Among the data recorded for each patient was a count of the number of spots of diameter less than 1 mm., between 1 and 3 mm., and over 3 mm. The number of spots of each size (per 100 patients) was therefore easy to determine for each age group. These estimates are illustrated in Fig. 6.

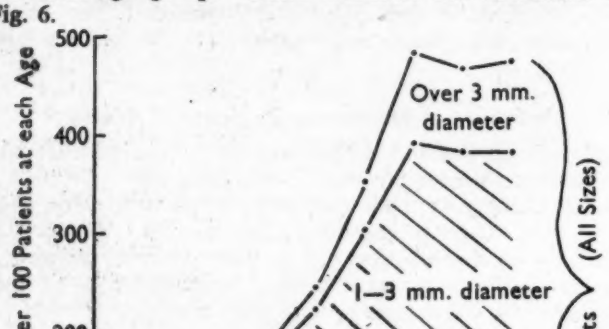

FIG. 6.—Influence of age on number and size of De Morgan's spots.

It will be seen that the total number of spots per 100 patients (represented by the top line in Fig. 6) increases at first slowly from zero at age 0–10 years to about 50 at age 21–30, and then increases rapidly to close on 500 at age 61–70; thereafter there is no increase. Again, it will be observed that the size of the spots, as well as the total number, increases with advancing age. Thus under the age of 30 years the majority of the spots are small (less than 1 mm. in diameter). Thereafter as age advances there is an ever-increasing proportion of spots of medium size (between 1 and 3 mm. in diameter). The proportion of large spots (over 3 mm. in diameter) also increases with age, but they never become very numerous: thus at age 21–30 years they account for about one-tenth of the whole, whereas in old age they account for about one-fifth of the whole.

The data already given (Fig. 6) can be made the basis of a rough estimate of the average rate of growth of the ruby spots. The estimate was made as follows:

Fig. 6 shows reasonably smooth sequences except at age 61–70 years, and the values given were therefore used direct, except that at this age the total count was arbitrarily reduced (at the expense of spots of medium size) from 481 to 430. The average number of years taken by the spots to attain a given diameter was then read off from the graph by a method best explained by illustration. Thus at age 36 (the mid-value of the decade 31–40) there was a total of 183 spots per 100 patients, of which 93 measured 1 mm. or more in diameter and the remainder were smaller. It was assumed that the larger spots had been present longer than the smaller spots. But a total count of 93 spots was present (reading from the graph) at age 29 years. It was inferred that the spots which measured 1 mm. or more at age 36 had been present for at least seven years. Using this method, the following estimates of the average time taken by ruby spots to attain a given diameter at various ages were obtained:

Age in years	No. of years required to attain a diameter of: 1 mm.	3 mm.
6	–	–
16	6	–
26	9	17
36	7	22
46	12	28
56	13	30
66	13	38
76	22	47

A high degree of precision cannot be claimed for these estimates, but the general statement can be made that the rate of growth of ruby spots decreases as age advances. Thus to attain a diameter of 1 mm. the spots require about seven years in early adult life, and about twice or thrice this period as age advances. Similarly, to attain a diameter of 3 mm. the spots require about 20 years in middle age, and about double this period in old age.

Summary

The literature of De Morgan's spots is reviewed and their possible connexion with cancer discussed.

Data on the incidence of ruby spots were obtained from observations on 1,300 patients at three Glasgow hospitals.

No difference was found in sex-incidence.

The proportion of hospital patients with ruby spots rises from 5% in adolescence to about 75% at 70 years of age. The spots also increased in number and size with advancing age, but their rate of growth decreased.

The proportion of Air Force personnel with spots was found to be much less than that of the hospital patients.

De Morgan's spots were slightly commoner in malignant than in non-malignant disease, but not sufficiently so to be of diagnostic importance.

The observations recorded here were made for the most part during our terms as house-surgeons under Prof. Illingworth in the Western Infirmary, Glasgow. We are indebted to the physicians and surgeons in charge and to the medical superintendents of the Western Infirmary, Stobhill Hospital, and the Radium Institute for permission to examine their patients. Our particular thanks are due to Mr. R. A. Jamieson for his help in preparing this paper and in the statistical analysis; and to Dr. R. A. Robb, of the Mathematics Department of Glasgow University, for suggesting the method of estimating the rates of growth. We have to acknowledge our indebtedness to the Air Ministry for permission to publish the data referring to Air Force personnel.

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Gleneagles Hotel, taken over for hospital purposes in 1939 by the Department of Health for Scotland, and since 1943 used as a fitness centre for the rehabilitation of miners, is being returned to the L.M.S. Railway Company. The Centre reopened at Bridge of Earn Hospital, Perthshire, on April 28, where its facilities will be extended by association with the work of a general hospital. Although originally miners only were accepted, any person in industry may now be admitted to the Centre if suffering from a disability which may yield to treatment. Patients can be admitted on application to the Medical Superintendent by their family doctor or the medical officer of a hospital. The Consultative Committee appointed by the Secretary of State for Scotland in 1943 to advise on the Centre is being reconstituted under the chairmanship of Sir Robert Nimmo. The Committee will now include representatives of the National Coal Board, the mining industry, employers and workers in industry generally, and the British Medical Association.

RELAPSING FEVER IN CYRENAICA

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The objects of this paper are to describe four cases of relapsing fever seen in Cyrenaica, one of which was contracted in Benghazi, to discuss the relevant literature, and to bring to light some new information (not our own) regarding vectors of relapsing fever in Cyrenaica.

The pre-war Italian work on the disease in this area is worth noting. Vernoni[1] was the first to describe a case of relapsing fever with positive blood film; this occurred in Barce (El Merg). Medulla has contributed a number of articles on the subject. In 1931 he drew attention to various types of recurrent fevers in Cyrenaica, most of which, however, had negative blood films.[2] In 1933 he described two cases, confirmed microscopically, which may have been infected in Benghazi[3]; and in 1934 he reported a further four cases which were infected while on military manœuvres in the Jebel, near Cyrene; only two of these appear to have had positive blood films.[4] In 1935 he published three more cases from the same source, in only one of which were spirochaetes seen in the blood.[5] In the same year he described a further well-proved case from Apollonia; in this instance the attendant doctor accidentally pricked himself with an infected syringe needle and five days later developed relapsing fever with positive blood film.[6] In 1937 Medulla reported a further three cases infected in Barce.[7] It is of interest to note that most cases in British troops during the war came from around Tobruk.[8] [9]

The following four cases were seen by us at 82 General Hospital in Benghazi.

Case 1

A Palestinian driver aged 21 had fever, headache, malaise, general aching, vomiting, cough, and constipation which started on April 30, 1944. He was admitted to hospital on May 3, when the temperature was 100.6° F. (38.1° C.). The liver was tender and enlarged one fingerbreadth below the right costal margin. The spleen was tender but doubtfully palpable. The axillary, inguinal, femoral, and epitrochlear lymph glands were tender and slightly enlarged, the tenderness in the axillary and inguinal regions being considerable. On May 4 the temperature was: morning, 102.4° F. (39.1° C.); evening, 104° F. (40° C.). The lymph glands were less tender and the abdominal tenderness had gone. A blood film revealed fairly numerous spirochaetes. There was much sweating. Next day the morning and evening temperatures were 102° F. (38.9° C.) and 104.2° F. (40.1° C.). The white cells numbered 6,000 per c.mm. (polymorphs, 85%; lymphocytes, 10%; monocytes, 4%; eosinophils, 1%). The blood films were again positive. Neoarsphenamine (N.A.B.), 0.6 g., was given intravenously. The temperature fell to normal by crisis the next morning and remained down. The lymph-gland tenderness had gone and the patient was feeling better. Further doses of 0.6 g. of N.A.B. were given intravenously on May 12 and 19. There was no relapse and convalescence was uneventful. The fever lasted six days, but he was never more than moderately ill.

This patient had not set foot outside Benghazi for a full month before the onset of his illness.

Case 2

An Italian P.O.W. aged 27 started to get vague abdominal discomfort, headache, and feverishness on June 13, 1944. He was admitted to hospital on June 15, when, apart from a temperature of 100.2° F. (37.9° C.), the only sign of disease was a spleen enlarged two fingerbreadths below the costal margin. There was no history of malaria. Early the next day the temperature had risen to 104.2° F. (40.1° C.) (Chart 1), and spirochaetes were found in the blood; he was given 0.6 g. of N.A.B. intravenously at once. The headache lasted one more day, but the fever persisted until June 21 (the ninth day of disease). On June 23 and 30 he received further doses of 0.6 g. of N.A.B. intravenously, but on June 25 a prolonged irregular pyrexia began which lasted until July 16. Repeated blood slides during this period were negative. At first he complained only of intermittent headache, but by July 4 (the 22nd

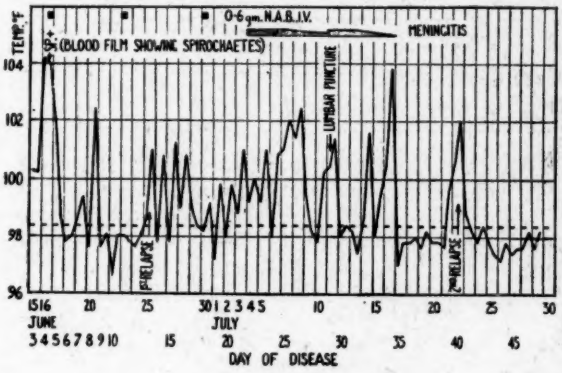

CHART 1.—Case 2

day) he was vomiting and the headache was severe. Two days later he was also drowsy and uncooperative. The white cell count was 9,600. After a short period of improvement vomiting recurred on July 11, and there was again severe headache, now with moderate neck stiffness, but no Kernig sign. A lumbar puncture produced clear cerebrospinal fluid under a pressure of 180 mm. of water, containing 600 cells (all lymphocytes) per c.mm.; protein, 180 mg. per 100 ml.; chlorides (as NaCl), 700 mg. per 100 ml.; no spirochaetes. Two days later he was much improved, but still complained of abdominal discomfort. He became symptomless by July 17, but on the 21st the ophthalmologist reported mild bilateral papilloedema. There was further fever (second relapse), after which he remained well. The haemoglobin (Sahli) was 110% on Aug. 14. The splenic enlargement diminished but did not disappear.

This patient's movements during the incubation period are not known in detail, but he came from Western Cyrenaica.

Case 3

An Indian pioneer aged 25 first became ill with fever, headache, malaise, and constipation on June 14, 1944. He was admitted to hospital on June 16. The temperature was 100.2° F. (37.9° C.), later rising to 103.4° F. (39.7° C.), with a rigor during which spirochaetes were found in the blood. Lungs: cough with numerous generalized rhonchi, many expiratory. Abdomen: tenderness in the iliac fossae, pronounced on the right, but considered not appendicular. The symptoms and fever continued for another day—temperature 102° F. (38.9° C.). On June 17 N.A.B., 0.6 g., was given intravenously. The fever had gone by the next day, but the chest was not clear of signs until June 21. On June 19 the white cell count was 4,000 (polymorphs, 78%; lymphocytes, 15%; monocytes, 7%). Further intravenous injections of 0.6 g. of N.A.B. were given on June 24 and July 1. There were no relapses and convalescence was rapid.

The movements of this patient during the incubation period could not be determined with accuracy, but they were wholly within Cyrenaica, and he had spent much of this time in Benghazi.

Case 4

A British lance-corporal aged 33 had sudden onset of headache, malaise, aches in the limbs, feverishness, and sweating on June 19, 1944, and was admitted to hospital the same day. The temperature was 101° F. (38.3° C.) (Chart 2). There were no other signs of disease, and the blood films were negative. There was a rigor on the next day and he vomited. The first blood film to show spirochaetes was obtained on June 21, and the patient received 0.6 g. of N.A.B. intravenously at once. The vomiting lasted one more day and the fever four days in all. The spleen became palpable on the last day of fever. There was no history of malaria. N.A.B., 0.6 g., was given intravenously on June 28 and July 5. On the 5th began a low irregular fever lasting four days (first relapse); the spleen remained palpable and there was headache and much sweating. A three-day symptomless afebrile period followed, after which, beginning on July 13 (the 25th day of disease), there

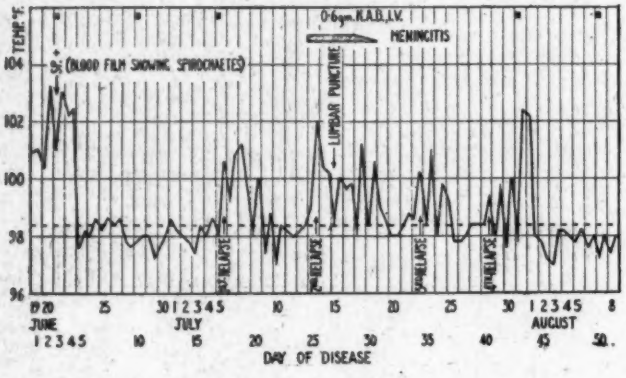

CHART 2.—Case 4

were six days of relatively low-grade fever (second relapse). Headache returned and worsened. On the 15th there was mild neck stiffness. A lumbar puncture on this date produced a clear cerebrospinal fluid under a pressure of 250 mm. of water, containing 40 cells (all lymphocytes) per c.mm.; protein, 45 mg. per 100 ml. (globulin not increased). A rabbit was inoculated with the cerebrospinal fluid but developed no infection. All symptoms had gone by July 19. The optic fundi remained normal. A low fever developed on the 21st (third relapse) and lasted three days; this pyrexial bout was relatively symptomless. A fourth relapse began on July 28 and lasted four days. Thereafter recovery was uninterrupted. Two more injections of 0.6 g. of N.A.B. were given intravenously on July 31 and Aug. 7. On the last date the haemoglobin was 80% (Haldane). The spleen became impalpable during convalescence. Numerous blood films from July 6 onwards were all negative.

This patient spent two nights in a billet in Tobruk within the incubation period and may well have contracted the infection there. Otherwise his movements had been inside Benghazi only.

The following is a summary of the symptoms and signs in the four cases.

Abdomen.—Vomiting (3 cases); constipation (2); vague pain (1); spleen enlarged (2); spleen tender (1); liver enlarged (1); liver tender (1); tenderness in iliac fossae (1).

General.—Fever (4); prolonged irregular fever (1); headache (4); malaise (3); shivering (2); general aches and pains (2); cough (2); noticeable sweating (2); lung rhonchi (1); mild anaemia (1); lymph glands enlarged and tender (1); meningitis (2).

Meningitis.—Headache (2); neck stiffness (2); abnormal cerebrospinal fluid (2); vomiting (1); drowsiness (1); papilloedema (1).

Other Points.—Relapses: two cases had none; one had two; and one had four. Length of pyrexial attacks (all treated), 1–22 days. Length of apyrexial intervals, 2–12 days. Length of stay in hospital: Cases 1 and 3, 20 days; Case 2, 73 days; Case 4, 69 days.

Spirochaetes were scanty in the blood films of Cases 2, 3, and 4; in Case 1 they were moderately plentiful. The effect of neoarsphenamine treatment was poor.

Discussion

It was not possible to carry out investigations to discover the species of spirochaete. However, none of the patients was lousy, and there was no reason to suppose that any had been in contact with lice. It can be assumed with a fair degree of certainty that the spirochaetes were tick-borne in origin, although it is just possible that in Case 1 they were louse-borne. The variation in the symptomatology and clinical courses of these four cases illustrates well the different forms that tick-borne relapsing fever can present. The rather long initial fever of Case 1 is more like the louse-borne type. The high incidence (2 out of 4) and type of neurological complications and the poor response to treatment with intravenous arsenicals are consistent with the findings of others reporting relapsing fever from Cyrenaica and the Egyptian western desert, notably Medulla,[5] Cooper,[10] Bulmer,[11] Scott,[12] McAlpine,[13] and reports and publications by Army medical consultants, M.E.F.[8 14 15]

The question of the vector in Cyrenaican relapsing fever is of some interest. The origin of the infection in Case 1 at least was Benghazi; Case 4 very possibly contracted it in Tobruk, a well-known infective centre.[8 10 13 14] In Cyrenaica, as in America, Palestine, Southern Russia, and, more recently, Cyprus,[16 17] the tick-borne disease, once recognized, will probably be found to be of wide potential if not actual distribution, corresponding to a wide scattering of *Ornithodorus* ticks capable of transmitting *Spirochaeta duttoni*. It is quite possible that louse-borne relapsing fever also occurs, serving to complicate the picture; the local inhabitants are frequently lousy. We have been informed by Major Walmsley that groups of nomadic Libyans in the hills of Cyrenaica periodically have minor epidemics of relapsing fever in their small communities. It is possible that this might be a result of camping in some spot infested with infective ticks; but such epidemics may be louse-borne or even mixed. Medulla[5] spoke of "the endemic illness in the highland districts" which is "transmitted by lice and by different *Ornithodorus* found in Cyrenaica." Manson-Bahr[18] states that the louse-borne infection is prevalent among the Bedouin Arabs of North Africa, especially in the winter months.

In most of the Italian papers reporting cases no indication or conjecture is given as to the source of the spirochaetes. But note was periodically made that patients had had no contact with lice.[19] On clinical and epidemiological considerations Medulla[4] thought that the four cases he reported in soldiers from the Cyrene Jebel were probably tick-borne; he suspected two *Ornithodorus* ticks known to be present in the district. In 1927 Lodato collected specimens of an argasid tick at Gadhames, Tripolitania.[20] Franchini and Taddia,[21] recording cases at Bardia of what was probably "tick-bite fever," reported the finding of "a new species of *Ornithodorus* that lives in grottoes, probably on small rodents." The ticks from both these collections were apparently first thought to be *Ornithodorus lahorensis* Neumann, but were identified by Maria Tonelli Rondelli as *O. franchinii*, n.sp.[21 22]

Parrot[23] described in detail a new *Ornithodorus* tick found in the Algerian Sahara; he named this tick *O. foleyi*, n.sp. Roubaud and Colas-Belcour[24] described a new tick from French North Africa which they named *O. delanoëi*, n.sp. This tick was differentiated from *O. foleyi* Parrot and *O. lahorensis*. From a comparative study these authors came to the conclusion that *O. foleyi* Parrot and *O. franchinii* Rondelli were probably the

same. However, Franchini[25 26] thought they were different species and claimed that he first described the tick later called *O. franchinii* Rondelli in 1927. Warburton[20] considers that *O. franchinii* is probably the same as *Argas brumpti*, Neumann, 1907, a tick which has characters of both *Argas* and *Ornithodorus* genera.

Garibaldi[27] summarized the geographical distribution of argasid ticks in Italian North Africa. He stated that *Argas persicus* (Oken) had been found at Benghazi, Kufra, Marada, Tobruk, and Tocra; *O. savignyi* Audouin at Augila, Kufra, Gialo, Giarabub, and Marada; *O. franchinii* at Porto Bardia, Kufra, and Marsa Lucch (the latter being between Bardia and Tobruk, on the coast). He stated that *O. moubata* Murray and *O. lahorensis* had been found only in Tripolitania, although Franchini[19] said that these two ticks had also been found in Cyrenaica. Previously Zavattari,[28] Gaspare,[29] and Franchini[30] had engaged in a controversy as to the presence of *O. moubata* in Libya—that is, in Italian North Africa. Franchini[31] stated that *O. savignyi* had not so far been found naturally infected with spirochaetes in Cyrenaica, but he was able to transmit *Sp. duttoni* to white mice through nymphs of *O. savignyi* from Agedabia. However, Kirk[32] states that in this tick the infection is not hereditary and that *O. savignyi* has never been found infected in nature.

In a publication by G.H.Q., M.E.F.,[15] it is stated that relapsing fever is "not uncommon" in "all parts of the western desert." Dewar and Walmsley[33] mentioned only ticks as vectors in the Egyptian western desert and in "Libya" (presumably they mean Cyrenaica). Stuart[34] reported that the louse-borne type is said to be very prevalent in Libya—that is, Italian North Africa—and that the tick-borne form also occurs there. He also said that "three recognized carriers of the disease have been recorded from Libya—namely, *O. moubata*, *O. savignyi*, and *O. lahorensis*." We have been unable to find any evidence in the literature that the last-named should be incriminated as a vector in Cyrenaica. Indeed, in spite of a considerable volume of work performed with *O. lahorensis* in other parts of the world, although there are some confusing opinions, no one has ever produced reliable evidence that it can transmit any strain of relapsing-fever spirochaete.[24 35-51 59] The same remarks apply, but with more force, to *Argas persicus*, a tick which in the past has been often wrongly spoken of as a transmitter of human spirochaetosis.[32 40 49 51-71]

It must be admitted that a study of the literature relating to relapsing fever in Italian North Africa leaves one with a rather confused picture as to the vectors responsible. No one, so far as we are aware, has ever inoculated human blood infected with Cyrenaican strains of relapsing-fever spirochaetes into laboratory animals in order to determine the vector (louse or tick). Little work on that aspect of the disease in this area has been possible during the war. Neither time nor facilities were available to us for laboratory or field work, and we know of only two collections of ticks made from this region during the war. One of these was at Tobruk in 1942 by Major Joe Bryant, R.A.M.C., and after leaving his hands this collection has not been traced. Bryant stated that his ticks were certainly *Ornithodorus* sp. The other collection consisted of one tick produced by a private soldier on admission to hospital in Tobruk with relapsing fever. The patient stated that the tick had bitten him, but there is no record of the time relation of bite to onset of fever.[88] This tick was sent at once to Prof. Adler, who informs us that during the war he also received two ticks from the Egyptian western desert, all three ticks being the same species. We are now informed by Prof. Adler and Dr. Theodor that all the ticks they received from the western desert were *O. tholozani* (syn. *papillipes*), Laboulbène and Mégnin. This is a new piece of evidence of considerable value. Hitherto *O. tholozani* had not been found west of Cyprus.[16] Transmission experiments performed with these ticks showed the two ticks from the western desert to be free of infection, but the tick from Tobruk was proved to be naturally infected with relapsing-fever spirochaetes (Adler and Theodor—personal communication).[88]

A final point of much less importance may be raised. It must be remembered, especially in connexion with cases occurring in towns, that some evidence has been produced that bed-bugs (*Cimex lectularius*)[49 67 72-79] and dog-ticks (*Rhipicephalus sanguineus*)[80-87] may cause isolated cases of relapsing fever. However, the evidence for this is by no means conclusive. The former are widespread in North Africa, and the latter have been identified in numerous places in Cyrenaica.[27]

Summary

Four cases of relapsing fever, probably tick-borne, are described. All contracted the infection in Cyrenaica; one was infected in Benghazi.

Two of these cases were complicated by meningitis, one of which had papilloedema. In these and other respects the four cases were of similar clinical type to cases from this area described by other authors.

The relevant literature, especially the Italian, is discussed.

Before the war Italian workers claimed to have identified one possible and two known carriers of relapsing-fever spirochaetes in Cyrenaica: respectively—*O. foleyi* Parrot (syn. *O. franchinii* Rondelli), *O. moubata* Murray, and *O. savignyi* Audouin.

Recently Adler and Theodor have identified ticks collected from Tobruk and the Egyptian western desert during the war as *O. tholozani*, Laboulbène and Mégnin, and have shown the Tobruk tick to be naturally infected with relapsing-fever spirochaetes.

Our thanks are particularly due to Prof. S. Adler and Dr. O. Theodor, of Jerusalem, for their kindness in supplying information about the ticks from the western desert. Thanks are also due to Prof. P. A. Buxton, Prof. R. M. Gordon, Brig. S. Smith, late R.A.M.C., Col. J. S. K. Boyd, late R.A.M.C., Dr. R. Kirk, Sudan Medical Service, and Major J. M. Drennan, R.A.M.C., pathologist, for valuable help in compiling this paper.

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TWO CASES OF FERROUS SULPHATE POISONING

BY

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After reading Dr. Gilbert Forbes's (1947) paper on poisoning with a preparation of iron, copper, and manganese I am prompted to record two further cases. It would seem that the condition may not be rare, and it is certainly one demanding increased precautions to prevent it.

Case 1

A 16-months-old girl was admitted to the Dundee Royal Infirmary on May 3, 1944. About 10.30 a.m. on that date she obtained a packet of 40 tablets, each containing ferrous sulphate exsic. gr. 3 (0.2 g.) copper sulphate gr. 1/25 (2.6 mg.), and manganese sulphate gr. 1/25. She swallowed all but one of these, and vomited almost at once, bringing up one tablet. Her mother gave her salt and water to drink, when about 12 more tablets were vomited. She thus retained about 26 of them. The child then became hot and drowsy and kept coughing and vomiting. The vomit contained mouthfuls of dark blood-stained materials.

She was admitted to hospital at 11.50 a.m. On examination she was rather pale, and was coughing and vomiting. The vomit was blood-stained. There was no rash or marked drowsiness. The temperature was 96° F. (35.6° C.), pulse 140, and respirations 24. The pulse was of slightly diminished volume. Her tongue was somewhat furred; the fauces were healthy. The abdomen was slightly distended. There was neither tenderness nor resistance on palpation. Nothing abnormal was noted in the central nervous system. Gastric lavage with a sodium bicarbonate solution was carried out, and brownish material was obtained. Some normal saline was left in the stomach. "Nepenthe" 1/2 min. (0.03 ml.) was given at once, and 2½ gr. (0.16 g.) of bismuth carbonate was given four-hourly.

In the evening she was breathing heavily, but was otherwise comfortable. There was no cyanosis during the night. No vomiting occurred, but one loose stool containing mucus and dark blood was passed. The temperature rose suddenly to 101.2° F. (38.4° C.) at 7.30 a.m. on the second day; her breathing became very difficult and she became cyanosed; she struggled, seemed to choke on inspiration, and died immediately.

Post-mortem Report (Dr. G. H. Smith).—A well-nourished female infant, rather cyanosed. Thorax: Heart and pericardium normal; both lungs show areas of patchy collapse and rather oedematous mucopurulent material in bronchi and trachea; no oedema of glottis. Abdomen: No free fluid in peritoneal cavity and no evidence of perforation. Stomach: Somewhat dilated. There is a large amount of brownish-black fluid present. The gastric mucosa is the seat of intense inflammatory change and there is a marked degree of necrosis and sloughing limited to the crests of the longitudinal rugae. Necrotic material from the stomach gives an intense iron reaction, the appearances being consistent with those due to corrosive poisoning. Numerous haemorrhagic points are apparent. Microscopical section shows necrosis of mucous membrane extending down to muscle. Intestines: Apart from a few patches of congestion in the upper jejunum, the intestines are healthy and the only contents present are black semi-fluid material resembling altered blood. Those contents are confined to the lower bowel, chiefly the pelvic colon. Liver: There is passive congestion. Neither hepatitis nor necrosis is present. Gall-bladder and pancreas: Healthy. Spleen: Healthy but congested. Kidneys and suprarenals: Healthy apart from venous engorgement. Ureter and bladder: Normal. Head: Brain and meninges healthy.

Case 2

A boy aged 2 years swallowed about 10 tablets similar to those mentioned above, about 9.30 a.m. on March 4, 1947. Approximately half an hour later he began to vomit green bile-

stained fluid. Two tablets were returned whole. There was no haematemesis. His colour became waxy, but had improved before admission to hospital the same day at 2.5 p.m. He was very thirsty. A stool passed later in the day was dark and gave the guaiac reaction for blood.

On admission he was rather flushed, listless, and drowsy, his pulse was regular and of good volume. There was neither tenderness nor abnormal resistance over his abdomen. Treatment consisted of mist. magnesium hydroxide and bismuth, along with glucose and saline, later changed to milk and subsequently to milk diet. By March 6 the vomiting had ceased, and on the 9th the stool was normal, with no blood. On the 13th the child was very well, but the stool was dark and the guaiac test positive. He had had no meat since admission. On the 16th the stool was again dark, and on the 18th he was well and there was no melaena.

Comment

Ferrous sulphate poisoning is a serious risk in view of the widespread use of this type of tablet. It is important that they should be kept in a place where children cannot obtain them, and that their potential toxicity should be realized by the profession.

The first patient died after consuming about 26 tablets. The second survived after retaining about eight. BAL, which was referred to in an annotation (*Journal*, March 22, 1947, p. 386), was not available for the former case in 1944 and was not required in the latter one.

An old name for ferrous sulphate is green vitriol.

It is important to realize that these cases and the two quoted by Forbes have all resulted from gross overdosage.

REFERENCE

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Medical Memoranda

Chronic Lymphatic Leukaemia in Man of 84

The following case, in which the leucocytes outnumbered the erythrocytes, seems worth recording on account of the advanced age of the patient.

CASE REPORT

A man aged 84 was admitted to Chase Farm Hospital at mid-day on July 14, 1945, with the preliminary diagnosis of pernicious anaemia. He was not fit for interrogation, but his daughter stated that he had been yellowish in appearance and breathless on exertion for "years." On examination he was well covered, with a pale skin having a lemon-yellow tint. His tongue was smooth. Rales were heard throughout both lungs, and there was a soft systolic murmur at the apex. The liver was palpable three fingerbreadths and the spleen two fingerbreadths below the costal margin. Reflexes: knee jerks ++, ++; ankle jerks, present and equal; plantar response, ↑; ↑. Lymph nodes were not palpable in the neck or axillae. At 3.15 p.m. he was given 2 ml. of "neohepatex" intravenously and 4 ml. of "anahaemin" intramuscularly. He died at 4 p.m.

A blood count showed: erythrocytes, 680,000 per c.mm.; leucocytes, 745,000 per c.mm.; reticulocytes, 19.6%; thrombocytes, 270,000 per c.mm. Because of the high bilirubinaemia it was found impossible to estimate the haemoglobin by Haldane's method. It was unfortunate, therefore, that difficulty in entering the vein of the moribund patient caused subsequent clotting of the blood in the Wintrobe collecting-tube. The blood clot did not show normal retraction after three days. The differential blood count (2,000 leucocytes) showed 97.75% of unusually small lymphocytes. Macropolycytes, macrocytic erythrocytes, numerous normoblasts, and cells with Howell-Jolly bodies were seen. The van den Bergh reaction was: direct, immediate positive; quantitative estimation, 36 mg., or 72 units, per 100 ml. The plasma protein was 7.7%; plasma albumin, 4.4%; albumin-globulin ratio, 1.3; plasma uric acid, 10 mg. per 100 ml.; plasma cholesterol, 250 mg. per 100 ml.

A post-mortem examination was carried out by Dr. J. G. Greenfield on July 16. There was general oedema of the lungs and consolidation in the right lower lobe. The heart muscle had thrush's breast appearance. The liver was pale brown, streaked grey in the portal spaces, but was not enlarged. The gall-bladder contained calculi and could not be emptied by pressure. The spleen weighed 1½ lb. (680 g.) and was of firm consistency; the cut surface showed enlarged Malpighian bodies. The lymph nodes were moderately enlarged in the mediastinum, abdomen, and groins.

COMMENTARY

The case was remarkable for the following reasons: the age of the patient; the leucocytes exceeded the erythrocytes; a reticulocyte count of 19.6%; the unusual degree of bilirubinaemia; the high plasma uric acid; and the possibility of coexisting pernicious anaemia. Panton and Valentine (1929) found that the average age incidence in 25 cases of chronic lymphatic leukaemia was 55 years, but the age of the oldest patient was not recorded. Biggs (1936) reported a case of lymphatic leukaemia in a man aged 83. Émile-Weil *et al.* (1938) described a series of cases of lymphatic leukaemia in patients aged from 64 to 81 years, the man aged 81 being the oldest leukaemic patient that they had seen. Although the leucocytes rarely outnumber the erythrocytes, high counts have occurred in other aged leukaemic patients. In Biggs's case they numbered 245,000 per c.mm., and I found 418,000 per c.mm. in a woman aged 75. Émile-Weil's cases, however, were all crypto-leukaemias or subleukaemic forms, the highest count being 15,000 per c.mm.

The blood for the reticulocyte enumeration was taken 20 minutes after the injections of liver extract. It is, however, difficult to believe that the high reticulocyte count resulted from the injections; moreover, Roth (1943) has reported a leukaemia with 18% of reticulocytes. It is of interest to note that the patient's colour never suggested the high degree of bilirubinaemia present. The raised plasma uric acid was possibly associated with the numerous nucleated red cells or the increased fragility of the lymphocytes, as shown by the smear cells. The signs of subacute combined degeneration of the cord suggested possible coexisting pernicious anaemia, but the data are not complete enough for a satisfactory diagnosis. Wintrobe (1942) considers that there have been only four acceptable cases in which the two diseases have existed simultaneously.

I wish to thank Dr. P. Hamill, under whom the patient was admitted, for permission to publish the case.

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Trichobezoar

The following case is placed on record owing to the large size of the hairball and because of the few symptoms it caused.

CASE HISTORY

A girl aged 18 was admitted to the Clayton Hospital, Wakefield, on April 5, 1946. She had been in good health until 10 days previously, when she started complaining of left-sided abdominal pain, "knife-like" in character and associated with anorexia.

On examination a large tumour could be felt extending across the upper abdomen, the shape of a dilated stomach. An *x*-ray examination of the stomach and duodenum was carried out, and Dr. Rose reported as follows: "This seems to be a very rare and interesting case of a huge hairball (trichobezoar) forming almost a cast of the lumen of the stomach."

At operation on April 12, Mr. E. R. Flint removed the hairball. The patient developed an acute dilatation of the stomach on April 14; this responded to treatment, and she was discharged from hospital on May 8. The hairball measured 17 in. (43 cm.) along the greater curvature, 15 in. (38 cm.) along the lesser curvature, and 8½ in. (21.5 cm.) in the largest diameter. The girl admitted to eating her hair as a child, mainly just before she went to sleep, but stated that she had not done so since she was 12 years of age.

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Reviews

ARTERIAL THROMBOSIS

Thromboses Artérielles. Physiologie Pathologique et Traitement Chirurgical. By René Leriche in collaboration with D. Ivan Bertrand. (Pp. 537; illustrated. 600 francs.) Paris: Masson et Cie. 1946.

Two of Leriche's earlier works—*The Surgery of the Arteries*, which appeared in 1943, and *The Surgical Treatment of Vasomotor Disorders of the Arteries*, published in 1945—constitute with the present volume a rich store of facts, observations, and clinical experience, but also stand as a permanent memorial to the vision and industry of the author as a pioneer in a field of surgical endeavour with which his name will always be associated. Though he has already contributed so much we look forward with eager anticipation to the next publication, and with good reason, for he devotes the early pages of his book to an eloquent plea for a revival in France of an interest in experimental surgical research.

After reviewing the causes of arterial thrombosis, among which he stresses the influence of endocrine disorders upon blood vessels, Leriche lays down certain rules about the relationships which exist between the state of the arterial coats and the extent of thrombosis and the organization of clots; and also about the ischaemic effects of thrombosis, which are due partly to mechanical obstruction of the arterial lumen, but also to neurogenic spasm of the more distal vessels. By the onset of spasm, which may be precipitated by remote factors such as haemorrhage, inflammation, cold, or a heart lesion, thrombosis suddenly becomes manifest. But the most important consideration in prognosis is the effect upon collateral vessels; thrombosis is well tolerated if it is localized and in the proximal part of a limb, but it is serious if the clot blocks many collaterals and disastrous if the process spreads to involve the companion vein.

The detailed description of the clinical manifestations of arterial thrombosis is arranged in three parts, the first dealing with traumatic thrombosis following contusion or rupture of arteries. In treating a wounded limb which shows signs of ischaemia the mere exploration of the artery and blocking the sympathetic nerve supply is not enough. If the artery is in spasm it should be stripped of its outer coat; if it is thrombosed or badly contused the affected part should be excised, and the sympathetic block must be repeated as often as is necessary. Arterectomy is undertaken in order to abolish vasomotor spasm as well as to prevent extension of the clot. These measures can abolish the pain of the causalgia type which appears immediately after wounding and will prevent Volkmann's contracture. The "chronic contusion" of arteries by pressure of a cervical rib, a crutch, or a bone after a dislocation or fracture is also described.

In the second part the author discusses spontaneous thrombosis in obliterative arteritis, devoting special attention to thromboangiitis obliterans. One of the few criticisms which may perhaps be allowed is that more attention has not been paid to the not uncommon thrombosis, of the popliteal artery especially, in the absence of Buerger's disease, and little notice is taken of the relation of the arterial blood pressure and arteriosclerosis to spontaneous thrombosis. The most interesting feature in this section is the author's support for the theory of the endocrine origin of thromboangiitis obliterans, and his advocacy of unilateral adrenalectomy (incidentally without a warning about the danger of removing a solitary suprarenal) in addition to lumbar ganglionectomy in its treatment.

In the third part he considers arterial thrombosis apart from the limbs—particularly at the bifurcation of the aorta and in the coronary arteries. The frequency of aortic thrombosis as quoted here seems astonishing at first sight, but it must be that the symptoms of fatiguability, atrophy, and trophic disorders in the legs, associated with impotence, are often attributed to some nervous or constitutional disorder, the diagnosis being missed because the absence of arterial pulsation distal to the bifurcation of the aorta has not been noticed. He advocates high lumbar ganglionectomy and, in favourable cases, excision of the bifurcation for this condition. In the section on coronary thrombosis Leriche gives a complete review of angina pectoris, in which he has had a special interest for many years. In this, as in many other chapters, those who are already familiar with his writings will recognize some of the lessons they have learnt from him before; but the fact that they are as welcome and as satisfying when repeated as when they were first heard is a high tribute to the author's genius.

J. PATERSON ROSS.

X RAYS AND THE SKIN

X-Rays and Radium in the Treatment of Diseases of the Skin. By George M. MacKee, M.D., and Anthony C. Cipollaro, M.D. Contributor, Hamilton Montgomery, M.D. Fourth edition, thoroughly revised. (Pp. 668; 321 engravings and 4 coloured plates. 50s.) London: Henry Kimpton. 1946.

This edition of what is probably the best book in the English language on its subject has been thoroughly revised. It is not often that with the passage of time a therapeutic weapon so potent as *x* rays becomes narrowed in its application rather than widened; yet this, as the authors point out, is what has happened. In the early days *x* rays were employed in many conditions in which later experience has shown them to be either unsuitable or less suitable than other agents. Nevertheless it is still true, as Dr. W. A. Pusey remarked over thirty-five years ago, that "roentgen therapy is the most widely useful addition to the treatment of skin diseases that has been made." The importance of the ill-effects of *x* rays may be judged by the space given to the consideration of radiodermatitis and radiocarcinoma. The pitfalls which lie in the path of the foolhardy are illustrated by the chapter on the medico-legal aspects of the subject.

The authors' account of cutaneous radiotherapy is well proportioned. The effects of radiation on living tissues are fully considered, and also the methods used and the results obtained in the treatment of all the varieties of skin disease which may be submitted to radiotherapy. Dermatologists will find this part of the book the most interesting. The authors hold the balance evenly between the extremes of uncritical optimism and unrelieved pessimism, and they found their conclusions on a comprehensive knowledge of the literature of the subject.

The format of the volume is well up to the best American standards; the clinical photographs are excellent and so are the four coloured plates, all of which are devoted to various aspects of *x*-ray disaster—an allocation somewhat out of proportion. However, any temporary false impression which examination of the coloured plates alone might convey will be amply dispelled by further study of the book, and we commend it unreservedly to all who are interested in cutaneous therapeutics.

H. HALDIN-DAVIS.

LIVES OF THE OLD

Old People. Report of a Survey Committee on the Problems of Ageing and the Care of Old People, under the chairmanship of B. Seebohm Rowntree, C.H., LL.D. (Pp. 202; illustrated. 3s. 6d.) London: Published for the Nuffield Foundation by Geoffrey Cumberlege, Oxford University Press. 1947.

For the first time an attempt has been made to discover how old people live and to assess their particular needs. The Nuffield surveyors' report discloses a disquieting state of affairs. Most old people continue to reside in their own homes, but the conditions under which they live vary greatly. Many are well cared for; some live in a single room where they eke out a precarious and miserable existence. Many—and this also applies to those who live with their relatives—would be willing to enter a hostel or home for old people if such were available. The number of suitable homes is small, and any one that opens is at once overwhelmed with applicants seeking admission. Some are nothing better than "farms" for the aged. The surveyors recommend that all such voluntary homes should be open to inspection, but it is difficult to define such places in terms that would exclude a hotel or boarding-house.

The report emphasizes that, though dire poverty is no longer a real problem for the aged, loneliness may be. Opening clubs for them may relieve it, but this provision is often difficult at present. An adequate supply of food is another difficulty. Many old people find shopping, with its waiting and queuing,

almost unbearable, and live on a miserable fraction of their rations. There is evidence that an appreciable amount of preventable ill-health, leading often to admission to hospital, is caused by under-feeding. The provision of meals by mobile canteens, supplied if necessary from Civic Restaurants, would make a great difference to the comfort of many old people.

The surveyors discuss at some length the employment of the elderly in suitable work and quote an impressive amount of evidence showing that they have a valuable contribution to make towards the nation's wealth—an important observation on our ageing population and one that should be studied. In a short note a medical subcommittee outlines a programme of long-term research into the factors that lead to ageing and other problems. The subcommittee remarks upon how little work has been done on the relationship between economic and social environment and the disabilities of old age. Inquiries are being carried out in Wolverhampton and Glasgow which should be fruitful. The lack of suitable homes in this country for old people of all social classes is notorious. The Poor Law has made its not very satisfactory contribution and the rest has been left almost entirely to voluntary bodies.

AMULREE.

FOOD IN THE HOME

Nutrition in Public Health. By Lucy H. Gillett, M.A. (Pp. 303; illustrated. 14s.) Philadelphia and London: W. B. Saunders Company. 1946.

Lucy Gillett has written this book for the public health nurse of America. It should interest health visitors and midwives in England provided they keep in mind the great differences in the food situation between the two countries. "Meat purchases," writes Lucy Gillett, "need careful watching to prevent them from crowding vegetables and milk from family meals. Fats should not be used too freely." The English reader will also study the food needs per week in tables 18, 19, and 20 with some of the envy depicted on the faces of the two children in the advertisement for a well-known brand of gravy powder. The book is based on sound common sense, is easy to read, and does not over-simplify a complex subject. The scientific principles of nutrition are made clear to the housewife; she is taught how to plan a meal for all circumstances and how to budget economically.

Men and women consume the following approximate minimum amounts of foodstuffs per week: milk, 4½–6 quarts (4.8–6.8 litres); eggs, 4; meat, 2 lb. (0.9 kg.); fats, 12–16 oz. (0.34–0.45 kg.); sweets, 12 oz. (0.34 kg.). The author recommends that for a low-income family of four persons, with the man working at a desk all day, the woman doing all the housework, a boy of 14 who plays football, and an athletic girl of 10, the weekly marketing list in the late fall should include 9 quarts (10.2 litres) of fresh milk, 12 tall cans of evaporated milk (equal to 10 quarts (11.3 litres) of milk), 6 oz. (170 g.) of cheese, 1½ dozen eggs, 8 lb. (3.6 kg.) of meat, 3½ lb. (1.5 kg.) of fats, 3 lb. (1.4 kg.) of sweets, 19 lb. (8.6 kg.) of cereals, and 24 lb. (10.6 kg.) of vegetables and fruit.

One might wonder why a book on the principles of nutrition should be required in the land of plenty, but the fact is that educating the housewife is more necessary where food abounds than where supplies are husbanded and doled out in exchange for coupons. Scarcity has taught us much; there is now greater need for such education where rationing is unknown.

FRASER BROCKINGTON.

The sixteenth edition of *Stedman's Practical Medical Dictionary* (London: Baillière, Tindall and Cox; 42s.), edited by Dr. N. B. Taylor, contains a new etymological section on medical terms. Mr. A. E. Taylor has tabulated the Greek and Latin roots from which so many of these words are built up, and the student learning, for example, the meaning of the root "schi" (from the Greek $\sigma\chi\iota\zeta\omega$) will recognize it in such words as schizophrenia and schizogenesis. Appendices include tables of weights and measures, the chemical elements (though neptunium and plutonium are not shown), and a list of pathogenic micro-organisms with the old and new nomenclature. Though the spelling preferred is American, words are listed also under their English form—for instance, anemia and anaemia. Brief historical notes on men whose names are used eponymously enliven the text. Students and practitioners will find that "Stedman's" is a valuable reference book.

BOOKS RECEIVED

[*Review is not precluded by notice here of books recently received*]

Synopsis of Operative Surgery. By H. E. Mobley, M.D., F.A.C.S. 2nd ed. (Pp. 416. 30s.) London: Henry Kimpton. 1947.

A summary of the technique of operative surgery, this edition includes an account of recent advances; many illustrations.

Janos, the Story of a Doctor. By John Plesch. (Pp. 579. 18s.) London: Victor Gollancz. 1947.

An autobiography by Prof. Plesch, with a portrait of Einstein by the author and anecdotes about many of his famous friends, including the Curies, Wassermann, Einstein, Fritz Kreisler, and Toscanini.

Dynamic Aspects of Biochemistry. By Ernest Baldwin, B.A., Ph.D. (Pp. 457. 21s.) Cambridge: University Press. 1947.

Designed as an introductory textbook to biochemistry for students specializing in this subject.

Forensic Medicine. By Keith Simpson, M.D. (Pp. 335. 16s.) London: Edward Arnold. 1947.

A textbook of forensic medicine and toxicology intended for medical students; many illustrations.

Scoliosis. By Beatrice Woodcock. (Pp. 111. 11s. 6d.) Oxford University Press. 1947.

Described as a practical and simple approach to the treatment of scoliosis; with many illustrations.

Tutoring as Therapy. By Grace Arthur, Ph.D. (Pp. 125. 8s. 6d.) New York: The Commonwealth Fund. 1946.

By "tutoring" the author means the individual teaching of children who have the intellectual capacity to understand school work but suffer from some mental or physical disability. She discusses the selection, training, and administration of teachers as well as therapy.

A Touch of Glory. By Frank G. Slaughter. (Pp. 272. 10s. 6d.) London: Jarrolds. 1947.

A novel about a doctor's struggle against medical "rackets" in Mexico.

La Reticulose Histiomonocytaire. By P. Cazal. (Pp. 195. 350 francs.) Paris: Masson. 1946.

A monograph on a group of pseudo-leukaemias—malignant diseases of the reticular stroma and the haemopoietic system. In French.

Handbook of Correctional Psychology. Ed. by Robert M. Lindner, Ph.D., and Robert V. Seliger, M.D. (Pp. 691. $10.00.) New York: Philosophical Library. 1947.

A symposium by various authors on the practical handling and rehabilitation of prison inmates.

Principles and Practice of Obstetrics. By Joseph B. De Lee, M.D., and J. P. Greenhill, M.D. 9th ed. (Pp. 1011. 50s.) Philadelphia and London: W. B. Saunders.

This edition includes new material on foetal erythroblastosis, premature labour, postmaturity, and the care of premature babies.

Experiences with Folic Acid. By Tom D. Spies, M.D. (Pp. 110. 21s.) Chicago: The Year Book Publishers. 1947.

A monograph on the use of folic acid in the treatment of macrocytic anaemias.

Improvised Equipment in the Home Care of the Sick. By Lyla M. Olson, R.N. 4th ed. (Pp. 265. 7s. 6d.) Philadelphia and London: W. B. Saunders. 1947.

An illustrated manual on improvised first-aid and nursing measures intended primarily for those who nurse the sick at home.

The Population and Epidemics of Exeter. By Ransom Pickard, C.B., C.M.G., M.S., F.R.C.S. (Pp. 83. No price.) Exeter: James Townsend. 1947.

An account of the population changes and epidemics of communicable diseases in Exeter since the 13th century.

Maladies et Syndromes Rares ou Peu Connus. By Prof. A. Aimes. (Pp. 205. 300 francs.) Paris: Masson. 1946.

Short notes on a large number of rare diseases, with bibliography.

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DAY NURSERIES AND INDUSTRY

During the war local authorities were urged by the Ministry of Labour to provide day nurseries for infants and children under 5 years of age whose mothers undertook full-time industrial work. These nurseries were established not for the sake of the mothers or children but with the specific object of increasing the woman-power available to the State, and mothers with more than one child, or at most two children, or mothers unable to work during their own illness, were therefore not allowed to use these nurseries. Of the women in industry at the beginning of 1945 about 1% had children in day nurseries.[1] After the war, though many nurseries were closed, the majority remained open. The shortage of man-power is still acute and is likely to remain a feature of our social life for years to come. So the Ministry of Labour is once more pressing for more full-time day nurseries. In some areas, particularly in the cotton-spinning districts of the North-West, firms are themselves providing nurseries or crèches for the infants and children of their women employees. Under existing legislation such industrial nurseries are not subject to the control of any outside body and may be good, bad, or indifferent. For many decades past, members of our profession, as well as social reformers, have urged that the employment in industry of mothers of young children is detrimental to the well-being both of the children and of the family, and that women should be encouraged and helped to look after their own young children at home. Have we reason now to reverse this policy? Our answer should depend on whether the provision of nurseries does in fact liberate essential woman-power, whether the physical and mental health of mothers and children is affected advantageously or adversely, and whether home life does or does not suffer thereby. Information is available on some of these points.

The women released by admission of their children to day nurseries cannot give steady service, since when the child is sick the mother must stay at home, and therefore they, like their children, presumably have an absentee rate of 25% and often more. Because of the absentee rate of children day nurseries admit to their registers some 20% more than they can accommodate. The investigations of F. Grundy,[2] Medical Officer of Health for Luton, are illuminating. After reviewing the figures available to him (number of mothers with two children in nurseries, number of children attending half-days or absent, number of nursery workers) he estimated that the provision of wartime day-nursery accommodation for 100 children would release 27 persons for whole-time work in industry. He also estimated the net annual cost of the nursery service (excluding administration costs and capital expenditure, but including loan charges on capital) as £192 per person released for whole-time industrial work. That was in 1943, and costs have risen steeply since then. Grundy's figures ignore all labour absorbed by the nurseries except that of women directly employed in them. To this, therefore, should be added the man-power consumed in medical supervision, in administration, clerical work and accountancy in the local authority offices, in laundry work, and in provision of equipment and replacements—a heavy item. When an absent child is sent to hospital the mother may remain in work, but trained labour is absorbed by the hospital services provided. It is obviously impossible to compute all this labour force accurately. We are paying a large subsidy for every mother thus entering industry, but it seems doubtful whether the nurseries do not absorb more labour than they free.

Every doctor, but not every business man requiring labour, knows that to congregate children in large groups increases the incidence of infection among them, and the younger the child the greater the risk. In an article in the last and present issues of the *Journal* M. McLaughlin gives data on the incidence of certain infections in day nurseries, based on work carried out over a period of 12 months in Birmingham, where work for the welfare of children is well known to be of a high standard. The results are clear-cut and striking: respiratory tract infections were two to eight times more frequent in children attending local authority nurseries than in a control group living in their own homes. The degree of difference in infection rates may surprise many doctors. It is true there were inevitably various differences in the social background of children in the two groups, but that this did not invalidate the comparison is shown by a previous large-scale investigation[3] organized (like the Birmingham investigation) under the auspices of the Medical Women's Federation, and carried out by child welfare medical officers in twenty-two local government areas in Great Britain, the results being analysed by W. J. Martin. This showed that nursery children examined within one week of admission, and home children examined as controls, had an approximately similar incidence of enlarged tonsillar glands, of mouth breathing, and of bronchitis, but that the incidence of these conditions rose strikingly in children over 6 months in the nurseries. Hence we can legitimately conclude that nursery life caused a deplorable increase in respiratory tract infection. McLaughlin found that 22.6% of the boys and 16.0% of the girls at nurseries suffered from chronic naso-pharyngeal infection, as against 2.8% and 2.0% among home children. What this portends in chronic sinusitis, and its sequelae, in later years among these nursery children is still unknown. Measles was epidemic in Birmingham during the year of the investigation, and the percentage of children under 18 months of age developing measles was more than six times greater in the nursery group than in the home group. Thus nursery life greatly increased the proportion of children developing measles when very

[1] Menzies, H., *Lancet*, 1946, **2**, 499.
[2] *Statistical Report to the Luton Borough Council*. 1943.
[3] *British Medical Journal*, 1946, **2**, 217.

young: the fatality rate among cases of measles in London fever hospitals before the war was about nine times as great for children under 2 as for those aged 5 to 9 years. Such is the cost of life in a day nursery to children's health—and this cost cannot be offset by the interesting fact that children over 3 years of age in the nurseries usually averaged about half to one pound heavier than the controls living at home: a fact which may result from the increased rations available to day nursery children under our present rationing schemes.

There exist no statistical data on the comparative mental health of children living at home and of children in day nurseries, and controversialists will no doubt continue to adhere to their own diverse opinions as to the relative value of home life and nursery life until statistical data are available. There is, however, a large body of opinion in support of the view that at least under the age of 3 years the child needs the security of his home and of proximity to his mother, and often suffers severely from being left in a nursery.

Double responsibilities and double work, in the home and in the factory, are well-recognized causes of illness among women workers. The task of shopping, washing, cleaning, mending, and cooking, and of tending husband and small child, in addition to doing a man's full-time work in factory or shop, is superhuman, and something must go to the wall. M. Back[4] has noted the squalor in the homes of some of these mothers. Some women who are not forced to earn for themselves and their children undoubtedly prefer factory life to minding the baby in the cramped quarters of their homes, though probably most of even this minority would choose to stay at home were they aware of the danger to children's health involved in nursery life. Menzies[1] has drawn attention to the large number of children withdrawn from the nurseries by their mothers "on account of fretting," or because they contract an illness.

It seems inescapable that the cost in children's well-being is such that the policy of encouraging mothers to take full-time work and leave their young children in a nursery cannot be justified except on grounds of overriding national economic need. If, as seems probable, day nurseries consume as much labour as they free, or more, all basis for this policy disappears, and it would be in the national interest to pay a family allowance to the necessitous mother sufficient for her to undertake the important work of caring for her family herself instead of paying a heavy subsidy for her labour in industry.

This is not to say that day nurseries have not a part to play in the social scheme; there remains the need of helping many mothers and young children—hampered by health, temperament, home circumstances, and other causes—by provision for the care of young children out of the home. Foster homes, "good neighbour" schemes, nursery schools, part-time and full-time day nurseries, and resident nurseries can all play their part, but this is a large problem and an essentially different one from that of the wartime or industrial day nursery. In the one case the guiding principle is the well-being of the individual mother and child, in the other the provision of more hands for industry. It behoves us to orientate our national policy on day nurseries in the light of the data available, and to obtain more factual information than at present exists as to the relative merits and demerits of various other methods of helping the overburdened mother of young children, or the young child needing other care than his mother's.

We know very little of the incidence of infection among children in residential nurseries, nursery schools, or part-time day nurseries, information which is essential when planning for child care. McLaughlin's cogent work compels attention in this field.

[4] *British Medical Journal*, 1943, **2**, 84.

RESEARCH ON THE COMMON COLD

Little has been done in investigating the aetiology of the common cold since the work of Dochez and his collaborators in the early part of the last decade. This work fully confirmed the existence of a filtrable agent in nasal and throat washings from persons with colds, which reproduces the disease in a substantial proportion of inoculated subjects, either chimpanzees[1] or human volunteers.[2] A further claim was made later that the virus could be cultivated in a medium containing chick embryo tissue, cultures retaining their capacity to reproduce the disease throughout numerous transfers occupying several months[3]; this observation is now regarded somewhat sceptically. It is noteworthy that during the period covered by this work Wilson Smith, Andrewes, and Laidlaw[4] discovered the transmissibility of epidemic influenza to the ferret. Research on influenza has proceeded steadily since that time, whereas that on the common cold has lapsed into oblivion. The reasons for this contrast are clear: the possibility of transmission to an animal which is available reasonably cheaply and in large numbers is almost a *sine qua non* for the thorough study of any virus disease. With this resource and the subsequent discovery of a simple method of titrating antibody the study of influenza has been enabled to cover a very wide field. Such methods have yet to be discovered and applied to the common cold.

It is to this problem that members of the staff of the Medical Research Council have been addressing themselves during the past year, and on May 2 the section of Epidemiology and State Medicine of the Royal Society of Medicine visited the Harvard Hospital, Salisbury, to see the conditions under which transmission experiments are conducted, and to hear of the results hitherto obtained. A report of the formal proceedings will be found elsewhere in this issue (p. 650). This hospital was a gift to the British nation from the U.S.A. and was staffed during the war by the Harvard Research Unit, formed originally for the study of epidemic disease under war conditions in England. Now vested in the Ministry of Health, the hospital could be used for no purpose more appropriate or more consonant with its wartime tradition than the prosecution of the present research.

[1] Dochez, A. R., Shibley, G. S., and Mills, Katherine C. (1930). *J. exp. Med.*, **52**, 701.
[2] Long, P. H., Doull, J. A., Bourn, Janet M., and McComb, Emily (1931). Ibid., **53**, 447.
[3] Dochez, A. R., Mills, K. C., and Kreeland, Y. (1936). Ibid., **63**, 559.
[4] *Lancet*, 1933, **2**, 66.

Its extensive staff quarters have been readily converted into a series of completely self-contained units each housing a pair of volunteers, who are isolated from all human contact—except during the daily visit of a gowned and masked medical officer and matron—for a period of ten days. After three days' isolation they are inoculated intranasally with experimental material, and all the features of any cold which may result are carefully recorded. The meeting had been fixed for the penultimate day of an isolation period, and the visitors were therefore permitted to enter the quarters and interview their inmates. It was surprising and gratifying to hear that a visit to Salisbury for the purpose of serving as a human guinea-pig is looked upon by university students and others as a very enjoyable holiday: some volunteers have served twice and applied for a third admission when the prescribed interval of 6 months is over, and admissions are fully booked until the end of this year. It is very greatly to the credit of the organization that such enthusiasm should have been produced. The Harvard Hospital has no claim to beauty: it is situated on a bare and very bleak hill-top, and the huts, although commodious and warm, are plain and simply furnished. The volunteers can walk where they will in the surrounding country; they are liberally supplied with books and papers, and each unit has its radio and telephone. These amenities, and no doubt the sense of participation in an important scientific experiment, must explain the popularity of this peculiar type of holiday.

The fortnightly influx comprises 12 pairs of volunteers, of whom 2 pairs are inoculated with known positive material, and 2 pairs with plain broth. None of those in clinical charge knows the content of the different fluids used: hence there can be no possible bias in assessing results. The inclusion of these two types of control leaves only 8 pairs in each group for inoculation with unknown test material, and owing to the fact that fully active filtrates produce colds in only about one-half of inoculated subjects the resources of the team were likened by Andrewes to those of an experimentalist restricted to the use of about a dozen mice per month. Thus, in spite of the elaborate organization which has been set up, progress is likely to be slow. The main object in employing this laborious method is indeed to discover another which shall be more readily applicable. Progress is likely to be achieved only when the virus can be propagated in some other way than in the human volunteer or chimpanzee, and among methods which are being tested is propagation in the developing egg. As Andrewes pointed out, there are four different routes for inoculating eggs, and the stage of their development may also affect the result: moreover, of 60 different viruses which have been studied in this way, three-quarters have been successfully propagated. There are therefore good reasons for hoping that this much simplified technique may prove applicable; fortunately, normal egg fluids produced only one cold and 3 doubtful responses among 20 volunteers.

A good deal of basic information about the behaviour of the agent in active filtrates has already been obtained. An epidemic of colds at Harrow, where the secretions of about 20 affected boys were pooled, furnished a stock of material which has been extensively used. The filtrate of this material retained its activity during storage at $-76°$ C. for over 4 months: it has also been determined that storage at $-10°$ C. is satisfactory for one month, and that activity is retained at $+4°$ C. for 3 days—a fact which enables material to be transported in an ordinary ice-box instead of being packed in carbon dioxide snow. The effect of dilution is not yet certain, and concentration has not been achieved. Particle size has been determined approximately by the use of graded filters, and the indications are that it is of the same order as that of influenza virus: since the number of volunteers tested with each filtrate other than that from the standard grade of filter was only 4, this conclusion must be regarded as only provisional. The incubation period of inoculation colds was most often 2 days, but sometimes 1, 3, or more: they appear to have been mild and uncomplicated, possibly owing to the absence of accompanying bacterial infection. An interesting observation, not easily explained, is that the frequency of positive results from inoculation has been unrelated to the length of the interval which has elapsed since the subject's last natural cold. It is to be hoped that this does not betoken the existence of numerous antigenically unrelated cold viruses.

The progress of this study, slow though it is likely to be, will be watched with much interest. It is reassuring to know that one of the principal lines of approach to the most banal and at the same time one of the most baffling problems in medicine is being pursued methodically by a full team of experts. Their anxiety that no early benefits should be expected is easily understandable: that progress in aetiological study does not necessarily afford any ready means of prevention or cure has been illustrated in the history of influenza. Whether any ultimately discovered means to this end will be on immunological, chemotherapeutic, or purely hygienic lines few would venture to predict. It is perhaps significant that the laboratory study of air disinfection by chemical and other means has also been transferred from Hampstead to the Harvard Hospital. Air sanitation is at least a practicable proceeding, the effects of which on respiratory infections are now being studied, and may well prove valuable.

SIR ALMROTH WRIGHT

By the death of Sir Almroth Wright British medicine has lost one of its most brilliant workers and one of its most picturesque characters. An account of his life is given in the obituary columns; here we shall attempt to appraise some of his contributions to medical science. Wright's father was a distinguished clergyman who had to educate a large family on a small income, so for economic reasons Almroth Wright had to win scholarships in such varied subjects as literature and law in order to pursue a university career. When he subsequently adopted medicine as his calling it was some time before he could decide which branch of medical science he should make his own. He worked at physiological problems with Wooldridge in Cambridge and with Ludwig in Leipzig, where he came

into contact with Pfeiffer, a leading figure in the then young science of bacteriology. It was as a physiologist that he went to Sydney, and although since his appointment as Professor of Pathology in the Army Medical School at Netley he has been called and known as a bacteriologist he remained to the end essentially a physiologist. Early in his career sleepless nights caused by a crying infant fed on cows' milk led him to apply his physiological knowledge, and by adding citrate he stopped the clotting of the milk in the child's stomach. He published his observation, but it was only many years after that citrated milk was advocated by paediatricians. He devised a method of measuring the coagulation time of the blood and by means of this estimated the effect of calcium salts, carbon dioxide, and other substances. He gave much time to the consideration of haemophilia, and wrote the chapter on this subject in Allbutt's *System of Medicine*. Another subject that interested him was acidosis, especially in scurvy, and later on in gas gangrene when this problem was presented to him in the war of 1914–18.

Almroth Wright's acceptance of the post at Netley must have marked his decision to give up physiology as a career. He soon became interested in the possibility of preventing bacterial infection by heat-killed vaccines. This was, of course, long after Pasteur had demonstrated that vaccines could make animals immune against bacterial disease, but Pasteur's vaccines were living attenuated cultures which, though suitable for immunizing sheep and cattle, were too dangerous for general use in man. Roux and others had shown that filtered cultures or dead cultures could produce immunity, but in these experiments they considered the fluid to be the active immunizing agent and not the bacteria, if present. Wright's original typhoid vaccine was a killed broth culture, but it was his conception that the active constituents of this vaccine were the dead bacteria. By blood tests of inoculated individuals he found that the vaccine stimulated the production of agglutinins and bactericidal substances. When he visited India as a member of the first Plague Commission he found opportunities of testing the efficacy of typhoid vaccine in some of the garrisons. These early observations convinced him that the vaccine did confer immunity. The vaccine was used to some extent in the South African War, but the resulting figures were very confused as at that time typhoid and paratyphoid fevers had not been properly differentiated. The statistical results in regard to typhoid vaccine in this campaign were the subject of considerable controversy, and in 1902 Wright left the Army Medical School and went to St. Mary's Hospital, which at that time was seeking for a head of the pathological department. At St. Mary's he founded his famous school of bacteriology.

For the next ten years he was preoccupied with the problem of vaccine therapy—the treatment of established infection by means of vaccines. With Douglas he developed the opsonic index and used it to control doses. The idea of vaccine therapy so controlled made a great appeal to doctors throughout the world, and for several years after 1905 workers from many countries came to Wright's laboratory at St. Mary's to learn his methods. In 1912 Wright went to South Africa to investigate pneumonia in the gold-mines, and he instituted a system of prophylactic vaccination which was continued for many years by Lister. In the war of 1914–18 Wright went to France as a consulting physician and set up a laboratory in the Casino at Boulogne, where he remained until the end of the war. He lived during these four years in the Rue Daunou, a few doors from the house in which he had, as a boy, stayed during the Franco-Prussian War. In Boulogne a number of his assistants from London joined him, and the team did much good work on the bacteriology and physiology of septic wounds and gas gangrene. It was then that extensive trial was made of the hypertonic salt treatment of septic wounds—a method which Wright had advocated many years before. This was based on the principle of drainage of the infected walls of a wound in contradistinction to the ordinary surgical drainage of the cavity of the wound. This method gained many adherents, and was the basis for the magnesium sulphate paste so commonly used in the casualty rooms. During these years Wright devised many interesting and beautiful methods of studying the function of leucocytes in relation to wound sepsis. He also introduced the method of immuno-transfusion. He had shown that the addition of a small dose of staphylococcus vaccine to human blood outside the body caused a rise in the non-specific bactericidal power of such blood, and in cases of severe sepsis patients were transfused with such vaccinated blood or with blood from an immunized donor. In the years after the war Wright continued this work on non-specific immunity and in the course of it evolved some useful methods—notably the slide-cell method for the evaluation of the bactericidal power of whole blood: this slide-cell method has been used for other purposes, especially by Fleming in his work on antiseptics and penicillin.

Almroth Wright's work and personality have had a profound influence on medical science. The success of typhoid vaccine stimulated research on other prophylactic vaccines —research which is still actively proceeding. The introduction of vaccine therapy provided another much-needed means of combating established infections, and it is a pity that this method has been abused. The discovery of the sulphonamides, and the development of antibiotics subsequent to the discovery of penicillin by Wright's pupil, Alexander Fleming, have made much of his work on vaccine therapy now a matter of academic interest only. Perhaps his greatest contribution has been his insistence that blood and other tests should be used to control therapeutic and preventive measures so that they may be used with intelligence. Bernard Shaw says elsewhere in this issue that men of science are usually rich in facts and poor in logic. Shaw's friend Almroth Wright was rich in both.

ASEPSIS IN SPINAL ANAESTHESIA

Since the earliest days of spinal anaesthesia a small proportion of patients given spinal anaesthetics have subsequently developed a type of meningitis which we discussed in these columns earlier this year.[1] In a number of recently reported cases in which meningitis has fol-

[1] *British Medical Journal*, 1947, 1, 187: see also the article by Kremer, M. Ibid., 1945, 2, 309.

lowed a spinal anaesthetic the nature of the infection has not been such as to suggest the skin, either of the patient or of the operator, as its source. It has been due, almost without exception, to some sort of Gram-negative bacillus, either *Ps. pyocyanea* or a nondescript organism of the type commonly found in non-sterile water. Moreover, non-sterile water has been incriminated as its source, the needle and syringe used having been "dished up" in supposedly sterile water which was subsequently suspected or proved not to have been sterile. The clearest proof of this origin was obtained in the Sheffield series of cases described by Barrie[2]; 11 out of 96 patients given spinal anaesthetics in one operating theatre developed meningitis, and the source of infection was found to be a defective Berkefeld filter supplying supposedly sterile water. A similar source was suspected in the two fatal cases of *Ps. pyocyanea* meningitis described by Evans.[3] Suggestive evidence of this possibility was furnished by the finding of the same organism in the cerebrospinal fluid of another patient without meningitis, this contamination being traced to a Winchester quart bottle of "sterile" distilled water. A bottle of sterile distilled water or saline cannot be depended on to remain sterile if it has once been opened.

A further series of cases due to the same type of infection, but of undiscovered origin, was recently described in this *Journal* by Vuylsteke.[4] Evans, in a further publication,[5] and Garrod,[6] who has recently reviewed this problem, make suggestions for a sterilization technique whereby such accidents can be avoided. Everything used for lumbar puncture, whether for spinal anaesthesia or for any other purpose, should be adequately sterilized by heat. Boiling will serve if necessary; dry heat is much to be preferred, and has the advantage that it can be applied at leisure, the apparatus then being always available for use when required. What should be avoided at all costs is some sort of chemical treatment, often itself unreliable, such as storage in spirit, and "dishing up" in water alleged to be sterile. This seemingly innocent liquid, harmless enough if introduced into any other part of the body, is fraught with danger.

IMMUNITY AFTER PENICILLIN

Is it possible for chemotherapy to be too successful? That is to say, may infection be overcome so exclusively by the chemotherapeutic agent alone that the normal defence mechanism need not function, that no immunity results, and a second attack may consequently follow? There are scattered items of clinical evidence suggesting this. Rantz, Boisvert, and Spink[7] found that when patients with streptococcal sore throats were treated with penicillin antibody formation was deficient. Plummer and his colleagues,[8] studying the same disease, found that a short course of treatment might be followed by a recurrence as severe as the original attack. This is evidently a question worthy and capable of experimental study, and P. E. Harrison[9] has undertaken this with most illuminating results. Rabbits were inoculated intradermally with pneumococci, the so-called "dermal pneumonia" of Goodner being produced. This is a spreading inflammatory lesion of the skin proceeding to septicaemia and death, and has the great advantage that the progress of the lesion can be directly observed. When penicillin treatment was begun in such animals four hours after inoculation the infection was aborted and no immunity whatever followed. This was tested by three methods: neither agglutinin nor protective antibody could be demonstrated in the animal's serum, and reinoculation produced a progressive and fatal infection. On the other hand, when treatment was begun 24 hours after inoculation the spread of infection was still checked and a high degree of immunity followed, as demonstrated by each of these methods. It is therefore evidently possible for penicillin, given sufficiently early, to eliminate infection with little or no co-operation by the body defences: this is perhaps to be expected from the fact that its action on bacteria in the early phases of growth is rapidly bactericidal.

These observations are made doubly interesting by parallel tests with sulphapyridine, sulphadiazine, and sulphamerazine. These three drugs acted alike and with quite different results. The infection became more extensive and was more slowly brought under control, and the immune response was greatest when treatment was begun after four hours; when it was delayed for twenty-four hours the response was poor, even though the animal recovered. The explanation of this reversal of the findings resulting from penicillin treatment derives from the fact that the sulphonamides do not immediately check bacterial growth; this continues for a time, liberating further antigen, the quantity of which is apparently optimal for antibody response under the chosen conditions when treatment is begun early. Delay results in the formation of an excess of antigen, which neutralizes some of the antibody formed. That this is the true explanation was proved by demonstrating the specific soluble substance of the pneumococcus in the blood of rabbits treated with sulphapyridine at a late stage, and by showing that the injection of this substance depressed antibody formation. Closely comparable results were obtainable in mice, in which the sole criterion was resistance to reinoculation. When the primary peritoneal infection was treated with penicillin the maximum resistance to reinoculation was obtained when treatment had been begun after twelve or eighteen hours. With sulphadiazine resistance was maximal only when treatment had been begun at the time of inoculation or after two or four hours; with longer intervals the ensuing resistance steadily diminished.

It is of course possible that these findings, especially those concerning the sulphonamides, are not applicable to infections by all bacteria other than the pneumococcus. Even so it seems justifiable to conclude that there is nothing to lose, and probably everything to be gained, by beginning treatment with sulphonamides as early as possible. In the case of penicillin, on the other hand, there is at least a theoretical possibility that very early treatment may have a disadvantage. Whether any further evidence of deficient immunity following prompt penicillin treatment can be gleaned from clinical experience will be known only if this possibility is borne in mind.

[2] *Lancet*, 1941, **1**, 242.
[3] Ibid., 1945, **1**, 115.
[4] *British Medical Journal*, 1947, **1**, 179.
[5] *Proc. roy. Soc. Med.*, 1946, **29**, 181.
[6] *Brit. Med. Bull.*, 1946, **4**, 106.
[7] *Science*, 1946, Mar. 22, 352.
[8] *J. Amer. med. Ass.*, 1945, **127**, 369.
[9] *J. infect. Dis.*, 1946, **79**, 101.

Dr. J. A. Brown, of Birmingham, has been elected for the term of five years a member of the General Medical Council as a direct representative in place of the late Sir Kaye Le Fleming. Dr. Brown received 14,035 votes, Dr. J. E. Outhwaite, 4,527, and Dr. I. Rose 695.

The next session of the General Medical Council will open on Tuesday, June 3, at 2 p.m., when the President, Sir Herbert Lightfoot Eason, will take the chair.

THE USE, COST, AND PROVISION OF INFANT HEALTH HOSTELS

BY

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It has previously been suggested that homes or hostels for mothers and their babies, which would bridge the gap between their discharge from maternity unit or hospital and their return to poor home conditions, should be a feature of the infant health services of the future (Lewis, 1946). Such hostels, however, might have a more important role in counteracting unsatisfactory social conditions than that of mere post-natal sanctuaries, and the subject clearly merits detailed thought. The local authority with which I was connected decided to set up a hostel, and the problem was examined from the local point of view. The results may be of general interest, because, apart from a review by the *Lancet* (1946) of convalescent-home facilities, this subject, especially as applied to the prevention of baby deaths and the promotion of infant health, does not appear to have received adequate objective treatment. For want of a better name, these hostels might be called infant health hostels, and their purpose would be to combat the unsatisfactory social and environmental conditions that only too often interfere with the rearing of healthy infants.

It would not be difficult to write at length on how they would do this. In brief, however, they would be used to conserve the health and well-being of the mother in the pre-natal period, and so prevent premature labour and reduce the incidence of prematurity; to act as the link between maternity units and hospitals and the home, and thus save the infant from being exposed to unsatisfactory home conditions until it could stand them—the baby would, in fact, be "hardened off" in a hostel; to assist certain mothers by providing means by which for a period they could give all their attention to the baby; to help selected unmarried mothers; and to give concentrated teaching in homecraft and baby-care, for most of the mothers admitted would need instruction in these important subjects.

To obtain the greatest benefit from an infant health hostel it would be necessary to ascertain the households where conditions were prejudicial to the healthy rearing of an infant, and to do this as early in the pregnancy as possible. We have called these households "observation households," for they should be kept under careful observation throughout the pregnancy, with a view to ameliorating the adverse conditions.

Cost of Infant Health Hostels

General.—In setting up an infant health hostel there seem to be two principles to follow: (*a*) As the function of the hostel would be to give individual help to mothers beset with social difficulties and to impart concentrated instruction in homecraft and baby-care, the proportion of staff to patients should be relatively high. (*b*) Although the babies admitted would not be under 2 or 3 weeks old, there would still be a risk of the various forms of cross-infection to which babies in institutions are always liable. If a serious infection were to break out, the smaller the unit the fewer would be the babies exposed. Therefore small units are to be preferred to large ones. The cost of a hostel would depend on its size and the staff necessary.

Size of the Hostel.—What is the smallest unit that can be made an economical proposition? The nursing staff would have duties peculiar to this form of hostel, for there would be little nursing as such, and no need for night duty so long as some responsible person was available when necessary. In order to allow the nursing staff off-duty and holidays in accordance with the Rushcliffe recommendations a minimum of three would be needed. It is considered that a staff of three could run a hostel containing 10 to 12 mothers and babies, and this would accord with principles (*a*) and (*b*) mentioned above. Considering the fairly heavy overhead charges to which a smaller hostel would be subject, the availability of suitable premises, and the scale of provision of hostels, it is probable that a hostel of 10 to 12 beds and cots is the optimal size to aim at.

Staffing.—The matron, or sister-in-charge, would be the key to the success of the hostel and must be carefully selected. She should be an S.R.N., possessing the S.C.M. and the Health Visitor's Certificate, and should have had practical experience of sociological and public health work. An active interest in and knowledge of baby-care and mothercraft should be an essential qualification. The other two nurses should have special knowledge and interest in young babies, should possess the S.R.N. with experience of infants, or should be State registered children's nurses. As in the case of the matron, an interest in the teaching of mothercraft would be essential. In view of the special qualifications required it might be possible to pay a small honorarium over and above the Rushcliffe scales in order to attract suitable people. It is anticipated that the mothers themselves would help in the domestic work of the lighter type, so there would be no need for a large domestic staff. One cook with two daily workers would be sufficient.

Capital Outlay.—When new maternity units or hospitals are being built it might be possible to incorporate an infant health hostel in the main building, thus reducing overhead charges, but for the present it would be necessary to adapt a large private house. Some guidance on what is required is given by Brodie (1946), who deals with homes for unmarried mothers; but, with minor modifications, her recommendations would apply to infant health hostels, as also would those put forward by the National Council for the Unmarried Mother and her Child (1946). The large old-fashioned type of house would generally have to be used, and it would need a good deal of alteration. A house of the size and type required could be purchased to-day for about £5,000; alterations might amount to £1 000 and equipment to £2,000—a capital outlay of about £8,000.

Yearly Expenditure.—The following estimate of yearly expenditure is partly based on the running costs of a small maternity home of 12 beds, allowance having been made for the differences in the types of institution.

Salaries of nursing staff	£770
" " domestic staff	568
National insurance, rates, and insurance ..	100
Superannuation contribution	40
Printing and stationery	25
Cleaning materials, painting, repairs, renewals	100
Maintenance of patients and staff	400
Petty cash, sundries, telephone	30
Bedding, drapery, earthenware goods	60
Light and fuel	300
Furniture replacements	50
Drugs and medicine	30
Gardening	300
Total	£2,773

Assuming that the 10 beds and cots were occupied throughout the year, the approximate cost per mother and baby would be £5 a week.

Provision of Infant Health Hostels

The scale of provision of infant health hostels would vary according to the area. Where social conditions were very bad the need would be greatest, and this would usually be in industrial areas where housing conditions were bad and the social environment poor. Powers to set up infant health hostels are apparently given by Section 204 of the Public Health Act, 1936.

The following gives some rough idea of the extent of the need. In 1945, of the 77 infant deaths investigated by Lewis and Blackwood (1946) it was estimated that a hostel might have helped to save 19 babies; in 1946 in a similar survey the estimated number was 16. It would, however, be the greatest mistake to consider only mortality, for there would be many babies whose lives might not be in acute danger, but who would benefit in health and well-being from being admitted to a hostel. This problem is better considered in terms of infant health than of infant mortality. By so doing, the net would be widely cast, and in saving the lives of the few the many would benefit. In the ascertainment of observation households referred to above it was estimated that between July and December, 1946, 25 mothers or mothers and babies would have benefited by admission to a hostel; over the whole year this would mean that about 50 should have been admitted. During 1946 there were 61 infant deaths in the area, so that according to these figures provision might be made for approximately one bed for each infant death.

Assuming that each mother and baby remained in the hostel for one month, 10 beds would provide accommodation for 120 cases a year. It is likely, however, that many mothers would be unwilling or unable to stay that time; to offset this, some might stay longer and there might be an occasional long-period case. If this approximate standard were adopted it is clear that only those authorities with over 100 infant deaths a year would find these hostels an economic proposition, unless joint hostels were set up or arrangements made for the admission of mothers and babies from adjoining local authorities.

There is virtually no well-documented practical experience of the use of hostels for saving infant lives, for while many authorities have made arrangements for sending mothers and babies to convalescent homes, a definite attempt to combat the effects of adverse social conditions at all stages of foetal and infant life by the extensive use of a hostel has never, so far as can be ascertained, been made. It would, moreover, avail little to set up a hostel unless this were accompanied by the ascertainment of observation households as early in pregnancy as possible. Remembering the relatively high cost, both capital and revenue, of infant health hostels, and that they must at first be experimental, it is evident that no extensive provision on the scale of one bed per infant death could be considered, but as an experiment in social and preventive medicine their use in selected areas may rightly be advocated. They can do no harm; they are certain to do some good; they may prove to be a means of saving many infant lives. To achieve this any reasonable expenditure of public money would be justifiable.

Summary

The uses of infant health hostels as a means of combating adverse social conditions are set out, the functions of hostels are referred to, and the indications for admitting mothers and babies are considered.

The optimal size of a hostel is 10 to 12 beds and cots. Staffing is dealt with and an estimate of the capital and revenue expenditure made.

The need for hostels is assessed. It is suggested that provision might be made on the scale of approximately one bed and cot per infant death per year. Until, however, the uses and value of infant health hostels are more clearly defined, they should in the first instance be experimental, and be set up in those areas where the infant mortality rate is high, as an organized attempt to reduce it.

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SOCIETY OF BRITISH NEUROLOGICAL SURGEONS

The Society held its spring meeting in Lisbon on April 10 and 11 under the presidency of Sir Hugh Cairns. The meeting was arranged to pay tribute to Prof. Egas Moniz for his pioneer work. It was he who introduced arteriography (in 1927), which was used in cerebral work first. The leucotomy operation for certain mental disorders was a later conception and was first performed by Prof. Lima in 1935. The visitors, including members from several European countries, were welcomed by Prof. Flores, of the Lisbon Faculty of Medicine, Prof. Moniz's successor in the Chair of Neurology.

Prof. Moniz spoke on thrombosis of the internal carotid and its branches, and on the interpretation of cerebral angiograms, especially the striking difference in circulation rate through the internal and external carotid systems. Prof. Lima described the diagnosis of subdural haematomas by arteriography. Prof. Furtado and Dr. Marques spoke about the Arnold Chiari malformation, Prof. da Costa on the neuroblastomas, and Prof. Fernandes on leucotomy. The technique of carotid arteriography was demonstrated by Dr. Imaginário, and of aortic arteriography by Dr. dos Santos. An excellent exhibition of cerebral angiograms included the early experimental procedures and instruments used for them, now of interest historically. Several communications, mostly relating to Prof. Moniz's work, were given by the visitors, including Mr. Norman Dott's on intracranial aneurysms, and Prof. Geoffrey Jefferson's on frontal lobectomy.

Reports of Societies

COMMON COLD RESEARCH UNIT

INTERIM REPORT ON A TRANSMISSION EXPERIMENT

A meeting of the Epidemiology and State Medicine Section of the Royal Society of Medicine was held on May 2 at the Common Cold Research Unit, Harvard Hospital, Salisbury, where for about a year, under the auspices of the Medical Research Council and the Ministry of Health, an investigation into the aetiology of the common cold has been undertaken. A succession of groups of volunteers have accepted isolation for a fortnight at a time in order that they might be tested with the common cold virus. The conditions and the outcome of the research so far are described in this report, and are the subject of a leading article at p. 645.

Members of the Section and others, who attended in large numbers, were received by the staff of the unit. They visited the isolation quarters—flats—of the volunteers and the air hygiene laboratory, and then assembled in the lecture hall, where a film produced by the Central Office of Information was projected. Dr. H. J. PARRISH, who presided, said that the common cold was responsible for the loss of 40 million man-days a year; yet he believed this was the first time the Section had had a discussion on the subject.

History of Harvard Hospital

Dr. W. H. BRADLEY gave an account of the origin of the hospital and of the unit. At about the time of Dunkirk, Harvard University planned to send to this country a group of field and laboratory workers to assist in the control of epidemics which were expected to arise. The Harvard unit grew into a team of more than 100 doctors and others; 22 buildings, prefabricated in the United States, were transhipped to this country and erected on a site near Salisbury secured and prepared by the Ministry of Health, and the hospital was formally opened in September, 1941. In selecting the location regard was paid to the suitability of the place for epidemiological studies of the detailed and intimate type called "clinical epidemiology." This part of Wiltshire had for the epidemiologist much the same kind of advantages as the "Pickles" country of Wensleydale. The hospital was for a while perhaps overburdened with beds (125); it became an E.M.S. hospital for both civil and military cases of communicable diseases, and no group of patients suffering from such diseases ever before received so much investigation and therapy. The course of the war unfortunately prevented the full benefit of the studies from being reaped, but some of the work was published in the reports for the war years of the Chief Medical Officer of the Ministry. With America's entrance into the war the hospital passed into the hands of the U.S. Army, and became the central laboratory for the American Army Medical Corps in the European theatre. The laboratories were extended and adapted for special purposes, and research units were established—one, for example, for the study of rickettsial disease. The place rapidly acquired a reputation as one of the foremost laboratories devoted to preventive medicine. With the invasion of France in 1944 the central laboratory was transferred to the Pasteur Institute in Paris, and with the cessation of hostilities in May, 1945, the American military authorities finally withdrew, though the place remained an important link between the United States and Great Britain and between Harvard University and its Faculty of Medicine on the one hand and the Ministry of Health and the Medical Research Council on the other.

The hospital was built specifically as an institute for the study of communicable diseases, and it was decided to adapt it to the purposes of a long-term research into the aetiology and transmission of the common cold. The staff and personnel house was converted into flats for the use of volunteers, and the staff of the unit and of some of the laboratories was housed in what had previously been the wards. The work was started in May, 1946, on plans which were first discussed less than six months previously.

It was seldom clear how projects of this kind began, but his first knowledge of it was a memorandum by Dr. C. H. Andrewes

suggesting that the advances made in virus work might now be applied to the study of the common cold, and this limited objective was adopted. The plan was to discover a method of studying the virus, which could not at present be handled in the laboratory by existing techniques. Human volunteers—the justifiability of using them was agreed to after much debate—were employed as indicators of the presence of common-cold-producing agents, and it was hoped that eventually a substitute would be found for them. Colleagues were always telling him that there was much else to be done in the study of the common cold. An attempt had been made to assess the priority of the various researches proposed, and they must not "bite off more than they could chew." Many extensions of the present research would occur to all of them, and these would be explored in due course.

The Plan of Research

Dr. C. H. ANDREWES said that it had been known for more than thirty years that a cold could be transmitted from one person to another by means of bacteria-free filtrates, and that such colds were transmissible in series. It had also long been known that chimpanzees—but no other kind of animal—could also be infected. A claim to have cultivated the virus in a tissue culture medium had not been confirmed. The most likely working hypothesis was that the filtrable agent which would produce transmissible colds in series was a virus, but not much was known of its properties because of the clumsy way in which it was necessary to study it. The primary objective was to find some substitute for the human volunteer, some laboratory method by which to recognize the presence of the virus. They were attempting, first of all, to adapt to the study of the cold a number of virus techniques which had been developed during the last fifteen years. They were concentrating attempts to grow the virus in fertile eggs, because about 60 different viruses had been studied in this way, and in about 75% success had been attained by one or other technique, so that there was a three-to-one chance of finding some technique of growing viruses in eggs. They tried to grow the agent in the egg, and then they had to use the human volunteer in order to decide whether the experiment was getting them anywhere.

It was not expected to solve this problem quickly. A succession of volunteers would be required for a period of years, and therefore the conditions must be attractive. The first volunteers were students during university vacations, and the idea was so popular that some of the students came again after a six months' interval. But it was necessary to get more volunteers, and on an appeal being made to the public 2,000 applications were received. It was thought that solitary confinement would be a deterrent, and therefore the volunteers were housed in pairs. They were given every possible freedom consistent with carrying out the experiment. If they had been required to wear wet socks and sit in draughts their noses might have run more freely, but the flow of volunteers would have dried up. The volunteers were kept for three days before receiving inoculation in case they had arrived already incubating a cold. It had been suggested, particularly by recent work in America, that there might be some infections simulating the common cold but with a much longer incubation period than two or three days. That was a serious criticism of the technique at present employed in the unit, but they were following it with their eyes open, and they hoped that if there were any diseases simulating the common cold they would not be led astray. If they had a longer incubation period—a fortnight or more to allow for the mild form of atypical pneumonia which simulated colds—they would halve the speed of the work.

The volunteers were isolated on the assumption that they were likely to pick up colds by contact with other people. No stringent precautions had been taken to prevent the infective agent reaching the volunteers by means of inanimate objects, such as newspapers or milk bottles; it was not believed that these were serious sources of danger. The system of controls was such that they would get some indication if these precautions were inadequate. A full-blown cold was not difficult to detect clinically, but there were bound to be many intermediate conditions, mild snuffles, and so on. To avoid any bias in any trial, certain volunteers received normal egg fluids or other material known not to contain cold virus, and nobody but the laboratory worker knew what was given to any volunteer, each person receiving the material from a numbered bottle. Twenty-four people—twelve pairs—were taken at each trial. Two of the pairs received a negative control material, and, in most trials, two a positive control material. This left eight pairs for the material it was desired to test. Something like 50% of people were resistant to the material, so that to test any one material it was necessary to take at least four subjects, two pairs, as the minimum. Their speed of progress was roughly that of the laboratory worker who was supplied with twelve mice a month. There must be no disappointment if progress was rather slow. Other angles of approach were possible in the future—a study of the individual resistance of the patient, epidemiological studies, air hygiene, climatology, and orthodox bacteriology, but they felt that orthodox bacteriology had been studied rather more than other aspects.

Routine of Experiments

Dr. D. K. M. CHALMERS, who has had the actual handling of the volunteers at the unit, said that the task was first to provide the bacteriologist with human subjects in isolation under such standard conditions as were practicable, and then to make the clinical assessment on which the results of the experiment were based. He described the recruitment, first of undergraduates, then members of the Red Cross, workers from certain selected industries, and finally the general public. The age limits were 18 to 40—after school age and before the setting in of the chronic catarrhal conditions of later life. People with asthma, hay fever, sinusitis, or a history of pulmonary tuberculosis were excluded. Conditions had to be as attractive as possible, not to spoil the volunteers but to retain their good will. There was almost complete freedom, except that they must not mix with other people. A distance of 30 ft. (9 m.) was regarded as beyond the reach of cross-infection. Each trial lasted for ten days. After a communal lunch on arrival, the volunteers were given a preliminary talk, underwent a medical examination of life insurance standard (but including an *x*-ray examination of the chest), and then went into quarantine for seventy-two hours to exclude incubating colds. Materials believed to contain virus or materials known not to contain virus were instilled into the nose, 0.5 ml. into each nostril, with the subject maintaining the supine position for two minutes, followed by the prone position for one minute. Neither the subject nor the doctor knew whether the one or the other material was used in a particular instance.

Clinical assessment began on the fourth day, and continued throughout the remainder of the trial. The matron recorded pulse and temperature daily on a chart. The criteria of each assessment were subjective and objective. Each volunteer reported any symptoms he or she might have. The appearance of the fauces was noted, and especially the evidence of what could be blown out of the nose on to the handkerchief. It might well be that the experimental cold induced in the unit was not the same thing clinically as the cold seen outside. For one thing, there should be less secondary infection. But the induced colds varied from the doubtful abortive cold to the abundant rhinitis. The incubation period was from twenty-four hours to five or six days. The Americans said that they could distinguish two types—one with a short incubation period of from twenty-four to forty-eight hours, and the other with a much longer period of from five to nine days. In the former the symptoms of running nose and coryza predominated; in the latter, sore throat and constitutional symptoms. This suggested that there might be more than one virus associated with the cold. In conclusion he stressed the fact that both the administrative arrangements for the volunteers and the methods for excluding extraneous infection were still in the experimental stage, but they were learning as they went along.

Interim Report

Dr. F. FULTON gave an interim report on the results of the transmission experiments. He described the method whereby the material was collected from the subject, sent to the laboratory and centrifuged. The filtrate, which was cleared of all bacteria, was then stored. The first problem was to determine whether it was possible to go on storing the material indefinitely and still maintain the life of the virus. It had been shown that the filtrate could be stored for at least four and a half months at −76° C. He showed tables indicating activity at this and at other temperatures. At ordinary icebox tempera-

ture, + 4° C., activity persisted for three days. An attempt was also made to determine the size of the agent responsible. The washings could contain substances of quite different sizes. It could not be said that the lower limit of size was fixed; the the upper limit was fixed, but not the lower. The most common incubation period was two to three days, but a few colds developed after five or six days, which was the limit of the period of observation; therefore the present observation period was not ideal, though the majority of colds would probably exhibit themselves within that time. It did not appear to signify whether the subject had had a cold during the previous month or had had no cold for six months. "The only thing we are certain about is that we have got some agent in the common cold filtrates which will induce colds in a percentage of the people; all the other results are tentative."

Questions

Dr. PARRISH said they were not yet at "the end of the beginning" of this investigation. The suggestion that women were much more susceptible to colds than men might be followed up; also an investigation might be undertaken into the determining factors in colds—an infection plus, probably, some depression of resistance due to climate, undernourishment, or some other factor.

Asked whether any complement-fixation tests had been tried, Dr. ANDREWES said that this had been kept in mind, but it was suspected that they would have to get the virus present and growing in greater concentration before that could be successful.

Did the particle size exclude the possibility of a filter-passing bacterium? Dr. FULTON replied that the filtrates had been cultivated under conditions which would be likely to grow these agents, and no growth had been observed at all.

Dr. ANDREWES, in reply to a further question, said that no intensive studies had been made on secondary infection because most of the laboratory work had been done at the National Institute for Medical Research, Hampstead, and the clinical work at Salisbury, but now that there was a bacteriologist on the spot it would be possible to do more along that line. No attempt had been made to induce secondary infections.

A questioner wished to know whether the filtrates had been stained and smeared and small bodies seen. There was a possibility of the use of fluorescent dyes in this connexion. Dr. FULTON said that that had not been tried. The electron microscope or ultra-microscope, said Dr. ANDREWES, had not been applied to the filtrates because the use of these instruments required considerable concentration of the material.

Dr. CHALMERS, in reply to a question as to whether one of the pair of volunteers who had a cold could pass it on to his partner in the flat, said that if a volunteer resisted the artificial cold given to him, and his partner took it, the former would resist also cross-infection. On the other hand, people who developed colds during the period of quarantine frequently conveyed such colds to their partners. He explained that each pair was given the same material.

In reply to Dr. J. A. H. Brincker, Dr. CHALMERS said that it was always recorded whether the volunteer had undergone tonsil or adenoid operations, but no correlation had yet been worked out. In further answer Dr. Chalmers said that only in two cases had a volunteer developed tonsillitis, and in one case bronchitis, which lasted for about a week. As for precautions against infection conveyed by those who handled food for the volunteers, he said that any member of the small domestic staff who developed a cold reported it at once. The handling of food was very carefully supervised.

Dr. SUTHERLAND said that he understood that during these experiments only one person had had to go to bed with the cold, and he only for a short time, which rather suggested that the type of cold was not comparable with that experienced by the ordinary patient. Dr. CHALMERS replied that the people were always asked the date of their previous cold, and how many colds they customarily had in a year, and whether they had had to stop work and go to bed, and the answer to the last question was invariably "No."

Dr. ANDREWES said that it was possible that the cold encountered in the outside world was a mixture of a virus and a bacterial infection, while in the unit a pure virus infection was given. The people had less chance of picking up secondary organisms from one companion in the unit than from mixing with a number of people. The volunteers were given a post-card and asked to describe what happened after their return to ordinary life. Frequently those who while in the unit had developed a cold, which had cleared up, developed a worse cold a day or two after resuming contact with the outside world.

Dr. ASHWORTH UNDERWOOD asked whether consideration had been given to the extension of the time of observation to seventeen days or three weeks, especially in view of the small number of samples. Dr. ANDREWES said that the time would have to be a number of weeks for convenience of administration. If one or two odd colds were found turning up when they should not, he did not think it would upset the experiment. They would have to tighten up their regulations and extend the period of observation.

Dr. CHALMERS, in reply to a question as to whether particulars of menstruation were taken in the case of the women volunteers in view of the frequency with which the nasal mucosa became congested just before or during the menstrual period, said that such particulars were recorded, but so far there had been no opportunity to work them out.

Dr. ANDREWES, who was asked whether it would be possible during the incubation period to get some information as to the flora of the nose, said that this was possible but hardly worth while, because there was such an enormous literature on bacteriology in relation to the nose and very little had come out of it.

Asked about work in America, Dr. ANDREWES said that two teams were working there on lines similar to their own; one of them was using as volunteers prisoners in a reformatory.

Dr. W. BUTLER asked whether those concerned were satisfied that the whole clinical field of the common cold was embraced. If the experiment were reversed, and the virus excluded, would there not be a certain number who would get a common cold, though perhaps distinguishable in some respects from the colds which were virus-produced? Dr. ANDREWES replied that he was constantly talking to people who spoke of pneumococcal and bacterial colds. Some colds might be caused by such organisms, but he would like to have an opportunity of studying such colds in order to learn whether it was possible to reproduce them with cultures. It would be interesting to take one of these pneumococcal colds and use a filter and see whether the cold could be reproduced with the filtrate.

Correspondence

Endocrines in Gynaecology

SIR,—I shall be glad of an opportunity of replying to the interesting and instructive letters from your correspondents during the past few weeks. The emphasis has been laid chiefly on the principle of receptor substances, or the specific sensitivity of the various tissues to the action of individual hormones, having been recognized for many years. This is well illustrated by the letters of Dr. G. I. M. Swyer, Dr. S. L. Simpson, Dr. Raymond Greene, and others. I did not wish to suggest that the receptor mechanism was a new concept. It is the basis of much of the maintenance of physiological processes of the body, including the intricacies of immunology.

In my address published in the *Journal* of Jan. 18 (p. 79) I said, "I have *seldom* seen it [the idea of receptors] mentioned, and *never* considered, in therapeutics." The italics should have been used in the original publication. While agreeing with your correspondents that the conception of receptors is not new, yet I still feel that, compared with the enormous amount of therapeutic energy devoted to the activating hormones, relatively little or no consideration has been given to laboratory or clinical research on the responsiveness of the organs we wish to treat. The important point is not so much the recognition of the principle of tissue receptivity but how far the idea has provided a basis for research into its tangible reality. So far very little.

I confess that I cannot understand Dr. Swyer's appeal (Feb. 1, p. 98) not to "complicate" the issue by adding the notion of receptor substances. All biological processes are complicated, but this should be, and has already been, a stimulus

rather than a deterrent to research. Some failure in physiological advance fifty and more years ago was due to the passion for simplifying processes which we know now to be of the most amazing complexity. Renal excretion and carbohydrate metabolism are two of innumerable examples. And now the clinical failure of endocrine treatment implies that until the problem becomes more "complicated" for the physiologist we shall make no further progress from our present static position. "Static" is the word. For some years we have achieved no real advance in this branch of endocrinology.

Prof. E. A. Doisy, of St. Louis University, has written personally to point out that it was the late Dr. Edgar Allen who concluded that cornification of the vagina is due to a hormone found in the Graafian follicle of the ovary. The important work of Stockard and Papanicalaou undoubtedly influenced the pioneer work on the ovarian hormones which was done by Dr. Allen and Prof. Doisy.

While discussing the general difficulties of hormone therapy I dwelt upon the paramount importance of the nervous factor in the control of the hormone system in man, and thus I agree strongly with Mr. Everard Williams when he draws attention (Feb. 8, p. 234) to the overriding influence of emotional disturbances acting through the nervous system in producing symptomatic effects in the various end-organs. It is almost certain that emotion such as the fear and fright of the air raids acted both through the pituitary and directly on the end-organs through their nervous supply. In addition to Mr. Williams's examples of menstrual troubles I remember the remarkable effect of the near-by bursting bomb in starting the immediate onset of premature labour.

Some correspondents have discussed details of treatment. Dr. Donald Fraser (p. 234) makes a plea for progesterone in metropathia. I quoted the work of Dr. Scowen in support of this treatment and also success following the use of testosterone. It is nevertheless true that many cases suffer relapses, which will compel us ultimately to treat these patients by *x* rays or hysterectomy. Dr. Raymond Greene's remarkable case of cure of eunuchism (March 8, p. 311), as proved by a subsequent pregnancy, is of great interest, and an encouragement to treat similar and less well established cases on the lines he describes.

But perhaps the best summing-up of the difficulties of endocrine therapy is given by Dr. A. P. Cawadias (March 22, p. 390) when he describes the disorder not as a separate disease of one or more of the six chief glands but as a pathological "complex" based upon irregular function of the whole psychosomatic system, including the endocrine glands, and all in relation to environmental factors. Through all your correspondents' letters can be traced agreement, with varying emphasis, on some fundamental points. The idea of cell receptors in the end-organs is by no means new, but it has not yet been exploited by researches which might enable us to expand our resources in treatment.

Finally, the patient apparently suffering from an endocrine disorder such as metropathia, amenorrhoea, and many others must be regarded not as one suffering from a terminal symptom but as a victim of genetic liability and environmental stress. The second of these will include such varied factors as nutrition, human relationships, conditions of work and play—indeed, all the manifold impacts inherent in our modern and troubled civilization.—I am, etc.,

London, W.1. ALECK BOURNE.

d-Tubocurarine in Electric Convulsion Therapy

SIR,—I have read with interest the articles on the use of *d*-tubocurarine in electric convulsion therapy, and in view of the fact that Drs. J. A. Hobson and Frederick Prescott (April 5, p. 448) state that they intend to adopt this method "as a routine" I should like to make some comment on this. Whereas one cannot fail to be impressed by the use of this method in a few of the cases mentioned, I consider that it is high time that some of the nonsense written about the dangers of E.C.T. should be contradicted by those of us who use this form of therapy on a large scale. In this hospital alone an average of 400 convulsions are administered each week, and in a period of six years well over 100,000 treatments have been carried out without major accident. It should be noted that some of the patients treated were over 75 years of age.

The occurrence of fractures and dislocations is, in my opinion, to be attributed to faulty technique rather than to the method itself, and I consider that the use of restraint by nurses is to be strongly deprecated, as it most definitely introduces a factor which may be fraught with danger. Figure 1 in Dr. Hobson's article (p. 447) illustrates this point. It should be quite unnecessary for anyone to actively restrain a patient during an electrically induced convulsion unless, of course, in the very rare instance where a patient may be in danger of falling out of bed.

The first case described by Drs. A. Gillis and D. D. Webster (p. 451) is of great interest, but it is unfortunate that the authors do not state the exact time which had elapsed between the receipt of injury and the commencement of E.C.T. I can see no reason why E.C.T. should have been contraindicated in the second case in the absence of vertebral injury, as severe back pain is not a very uncommon symptom but one which usually disappears during the course of treatment.

In making these criticisms I do not wish to detract in any way from the value of *d*-tubocurarine in a few cases, but, as the authors admit, it calls for skilled technique, and as the method itself is not without danger it should surely be used with the greatest discrimination.—I am, etc.,

St. James Hospital, Portsmouth. W. LIDDELL MILLIGAN.

Phaeochromocytoma

SIR,—Are not the symptoms of phaeochromocytoma of the adrenal medulla, described in two interesting articles in the *Journal* of April 26 (pp. 563 and 564), suggestive of those of the so-called "anxiety crisis" writ large? As a victim of these crises, the full nature of which can be understood only by those who undergo them, I have the most profound sympathy with the young woman who "was 'nervous' and anxious to demonstrate that her disease was not functional."

No reasonable person would be anxious to demonstrate that his symptoms had their origin in so grave a condition as a suprarenal tumour, but neither does a reasonable person find it satisfying to be told that his prostrating attacks are purely functional, due to some underlying worry of which he has never been conscious. His own rational brain gives him all sorts of reasoned assurances as his bout develops, but his instinctive feelings are filled with the most positive certainty of his imminent exitus and are suffused with fear, not the fear which he may have felt when exposed to real and obvious danger such as heavy air-raids, but the horrible paralysing fear which arises in the worst type of nightmare and which strips from him the last vestige of his self-respect.

My own attacks have beset me for more than a dozen years. During the intervals between them it is easy to tell myself that if their origin was serious I should not have continued to survive, yet each bad one finds me as vulnerable as any of its forerunners.

As I grow older in practice I find myself more and more convinced that much illness which we now glibly dub "nervous" and hand over to the psychiatrists will be found to have a purely physical basis, which may well have a quite trivial importance when compared with its effect on the psyche. If the day ever comes when necropsy by a skilled pathologist is obligatory for everyone, it will probably bring an enormous acceleration in medical learning, and it is at least possible that our present unsatisfactory fumbling with the human mind will be diverted into more useful channels.

In view of the personal nature of this letter may I have your leave to sign myself

X.

The Adrenal Medulla and Hyperpiesis

SIR,—In regard to the annotation on the adrenal medulla and hyperpiesis (April 26, p. 572), we have repeatedly tried to discover whether the adrenaline content in the blood is raised in hypertony, but without success. But the following experiments which O. Weiss and I performed many years ago are significant.

Adrenaline was injected into a cat and arterial pressure taken by kymograph. There was a very pronounced rise of pressure but lasting only a moment. After the arterial pressure in this cat had returned to normal, blood was taken from it and injected in another cat. The latter animal produced the same

adrenaline reaction as the first. Thus it has been established that, although the adrenaline content of the blood in the first cat was still abnormally high, after an initial rise of pressure it did not further affect the blood pressure level. But after severing the nerves from the blood vessels of the ear, the adrenaline effect lasted for hours. It is quite clear that the vasoconstrictors and vasodilators counteract any factor which tends to produce abnormal pressure. The level of pressure is conditioned by the requirements of the body and not by abnormal substances in the blood such as adrenaline or renin, which tend to raise the pressure. This is the reason why it is so very difficult either to raise or to lower arterial pressure for any length of time.—I am, etc.,

Liverpool. I. HARRIS.

The Revolution in Anaesthesia

SIR,—Dr. John Halton (April 19, p. 543) has painted a fanciful picture of the benefits conferred by curare on the inefficient anaesthetist. No one will gainsay that curare is, in certain circumstances, of great help to surgeons and anaesthetists, but the patient is the most important person in the operating theatre and the benefits conferred on the patient are more questionable. When anaesthetized by ordinary methods he has at least a reasonable expectation of recovering consciousness and of a convalescence free from complications. In a series of over 50 gastrectomies relaxed with curare which have come under my observation the incidence of collapse of the lung base, confirmed by *x*-ray, is 20%, and this high figure has been confirmed by other observers. Bleeding with curare is often considerable, and I have been asked by a surgical colleague to refrain from using it for this reason alone. Several deaths have been reported from regurgitation of stomach contents into the lungs. Relaxation *can* be carried a little too far.

The introduction of a new drug is always accompanied by a pendulum-like swing of enthusiasm followed by a swing in the reverse direction, after which the true position of the drug in medicine is determined. I suggest that the time has come to cry halt and reflect on the lethal possibilities of this very potent drug. Dr. Halton has spoken of a revolution in anaesthesia, but history contains many examples of revolutions which have not proved beneficial.—I am, etc.,

London, W 1. MASSEY DAWKINS.

SIR,—Dr. John Halton's masterly exposition on the use and abuse of modern anaesthetic technique (April 19, p. 543) will be greeted with acclamation by every anaesthetist who understands the physiology of respiration and is thoroughly conversant with the action of the drugs and agents which he uses. My only comment is that he made some omissions in his true and vivid picture; he made no mention of the final "shot" of "tubarine" to enable the peritoneum to be closed and to guarantee the production of "the twilight of that half-world known as 'recovering from the anaesthetic,'" which justifies matrons of nursing homes pressing for the abolition of curare (*Journal*, Jan. 18, p. 111; Feb. 8, p. 234).

He rightly stresses, but no one could overstress, the need for maintaining adequate tidal exchange and the avoidance of anoxia; he omits to mention the danger of an insidious build-up of carbon dioxide responsible for the production of so-called "cyclo shock" (*Anesthesiology*, 1947, **8**, 15). Surely when the respiratory centre is depressed by opiates, barbiturates, and what you will in the way of anaesthetic agents and has its peripheral response stultified by intercostal paralysis, possibly combined with diaphragmatic paralysis or paresis, the final physiological insult is to expose it to excess of carbon dioxide by cutting out the absorber or adding from a cylinder.

No absorber is too efficient; the danger of losing the "Bohr effect" and producing the "acarbia" spoken of by Yandell Henderson is a relic of the past and could only be produced now by the most energetic hyperventilators, who could, no doubt, also squash your alveolar capillaries flat and kill you with a chest full of oxygen. Equally nefarious is the practice of relying primarily in times of crisis on alleged antidotes such as "prostigmin," picrotoxin, "coramine," etc., rather than maintaining normal or near normal oxygen–carbon-dioxide balance.

As one of the first to suggest that the advent of curare cast doubts on the theories of Crile (*Proc. roy. Soc. Med.*, 1946, **39**, 410) may I join with Dr. Halton in his hope that the rational use of curare will make it a milestone in anaesthesia rather than that by abuse it should become a tombstone.—I am, etc.,

Aylesbury. H. W. LOFTUS DALE.

B.C.G. Vaccination by International Exchange

SIR,—The Scandinavian countries, with their many years' wealth of B.C.G. experience, are now exporting not only advice but also personnel. Dr. Konrad Birkhaug, who was in charge of the B.C.G. laboratory in Bergen before and during the war, has gone to the U.S.A., where the State Health Department has borrowed his services. In Denmark the Danish Red Cross has a scheme for B.C.G. teams, each consisting of a doctor, two nurses, and a secretary, to go to Warsaw, Budapest, and Rendsburg to vaccinate their populations, children first. What about a loan of Scandinavian experts to England? Assuming that B.C.G. vaccination is not an all-British watertight compartment, I would suggest that the Ministry of Health or the National Association for the Prevention of Tuberculosis sends a "come-over-and-help-us" call to their opposite numbers in one of the Scandinavian countries, say Sweden.—I am, etc.,

Sunnfjord, Norway. CLAUDE LILLINGSTON.

Acid Drinks and Sulphonamide Therapy

SIR,—The danger of renal complications during sulphonamide therapy and the importance of giving extra fluids to patients receiving these drugs are universally recognized, but the necessity for avoiding acid fluids and maintaining alkalinity of the urine have not been given the same prominence in the literature.

The M.R.C. War Memo. No. 10 (Medical Use of Sulphonamides) states that 30–80% of the total dosage can be recovered from the urine either as the sulphonamide itself or as its acetyl derivative. The following table, also taken from the Memorandum, shows the solubilities of some of the sulphonamides and of their acetyl derivatives in both acid and alkaline urine, and from this I have worked out the daily output of urine necessary to hold 3 g. of each of the sulphonamides in solution—that is, 50% of an average daily dose.

	Solubility in Urine (mg./100 ml.)		Volume of Urine Needed to Dissolve 3 g.	
	Acid	Alkaline	Acid	Alkaline
Sulphathiazole	102	859	3,000 ml.	350 ml.
Acetyl sulphathiazole	10	265	30,000 ,,	1,200 ,,
Sulphadiazine	17	187	17,500 ,,	1,500 ,,
Acetyl sulphadiazine	50	229	6,000 ,,	1,300 ,,
Sulphamezathine	130	335	2,300 ,,	900 ,,
Acetyl sulphamezathine	86	216	3,500 ,,	1,400 ,,
Sulphamerazine	38	209	8,000 ,,	1,400 ,,
Acetyl sulphamerazine	78	227	3,800 ,,	1,300 ,,

This table shows that with an average daily output of 1,500 ml. the urine *must* be alkaline, otherwise part of the sulphonamide excreted will be thrown out of solution.

In most hospitals extra fluids are supplied in the form of imperial drink, lemonade, or orangeade. These substances are highly acid, as the following rough experiment shows. Samples were taken from the patients' jugs in the wards and neutralized with sodium bicarbonate. The quantity of bicarbonate required to neutralize 1 oz. (28 ml.) of each fluid was as follows:

Orangeade	15 gr. (1 g.) of bicarbonate
Lemonade	15 gr. ,, ,,
Imperial drink	11 gr. (0.72 g.) ,,

Thus with a daily intake of only 3 pints (1.7 l.) of the fluids in question the amount of bicarbonate required to neutralize it works out at 900 gr. (60 g.) for lemonade and orangeade and 660 gr. (44 g.) for imperial drink—this before alkalinization of the patient can begin. The usual routine practice of giving a dose of alkali with the tablets can only serve to neutralize a small part of the fluid with which they are washed down, and the forcing of fruit drinks increases the acidity of the urine.

It is therefore apparent that if renal complications are to be avoided when giving sulphonamides, all fruit drinks must be strictly forbidden, and the extra fluids required must be given as water, milk, tea, etc.—I am, etc.,

London, E.7. PETRONELLA POTTER.

Shortage of Nurses

SIR,—My father died recently after a long illness. Towards the end I engaged a man to help with the night-nursing. He was an excellent fellow and a most competent nurse. He made a living doing casual private nursing as he was not qualified to obtain the responsible hospital post he desired. Twelve years he had spent in the R.A.M.C., and although he had left the Service with an excellent character and the qualification of First Class Nursing Orderly he had sought in vain for a civilian nursing post suitable for a man of his ability. He was only 30, keen, competent, and reliable—but he had no civilian qualifications. Training for State Registration was out of the question; he was a family man and had to live. He could call himself a Service Trained Male Nurse, but this would open to him only the menial and less responsible positions in nursing.

This must happen so often, Sir, that I wonder how the Service medical authorities can be blind to its effects. Time and time again good ex-Service male nurses drift into other occupations because they are unqualified by civilian standards. This loss to nursing is all the more tragic at the present time when public assistance hospitals are closed for want of trained staff. My experience has convinced me that a scheme could be evolved whereby orderlies in all three Services would be obliged to obtain a nursing diploma as a prerequisite to advancement. The professional examinations for higher rank or rating could and should be brought into line with civilian standards. In this way the qualified Service nurse would automatically be a qualified civilian nurse and could be fully and usefully employed on his discharge from the Service.

I know it will be argued that while in the Service these men have the chance of taking civilian examinations if they wish. I doubt if this is always true, but in any case the initiative should be with the authorities. If this waste of nursing personnel is to be checked, orderlies must be made to take examinations recognized for a nursing diploma—and the fees must be paid by the State.—I am, etc.,

London, N.W.1. R. HOWELL ROBERTS.

SIR,—Would it not be helpful if there could be a scheme whereby nurses could attend patients during early convalescence in their own homes, thus allowing more room in hospitals for acute cases and for helping to reduce the present long waiting-lists? If recruitment to the nursing profession were to be carried out according to grades, there should be a supply to meet such a demand—say Grade A, where the standard of entry was dependent more on character and personality than on the "knack" of having passed examinations. Such nurses would be able to carry out all the duties required of a good practical nurse without having to pass examinations, which proves so great a stumbling-block to the recruitment of nurses at present.

This Grade A nurse would probably include most of those who are lost to the profession at present on account of the amount of theoretical lectures and reading they have to do for even the Preliminary Nursing Examination. They should get a thoroughly practical training and could qualify for an external nursing service attached to their training-school or interchange with other hospitals. Under such a scheme nurses could be sent home with early convalescent patients or they could be sent out to attend other patients in their homes at charges drawn up according to scale by the hospital almoner. A system of home nurses should help to reduce the number of patients who have to go to hospital for observation or for only a few days' treatment or because they live alone or have nobody to attend them at home. The external auxiliary nurses should be able to live at the hospital and be called in to help there when necessary for, say, only a limited number of weeks each year. There should be a block of one- or two-room flatlets with service, catering, and laundry facilities. They should be relieved of certain household responsibilities and so get proper leisure. At present private nurses often live in one room, or move about from room to room in a club, between cases. They should be able to rent the flatlet and come back to their own room and not have to pack up before going to a case. Only so long as they served the hospital should they be allowed to be tenants of a flat, but they should be tenants on the same terms as tenants of any other block of flats in the country.

Grade B nurses would be mostly women who wish to enter the profession when they are older and have gained some experience of the world and people. The age limit of 28 years would not be too high for such entrants. Grade B nurses would most likely be qualified to shoulder the responsibility of sisters, house-sisters, sister-tutors, or matrons. If any Grade A nurse proved to be exceptionally able she should be allowed to transfer to Grade B at the end of her first year and have an extended period of training of, say, six months along with the examinations required for Grade B nurses.

Grade O nursing orderlies are those women who like looking after and doing things for other people but who from educational and other reasons cannot take up nursing proper. They could carry out routine duties in the wards, in the kitchen, and in the residential quarters. They should be moved about during their training but later become attached to one special ward or sister when such an arrangement is proved mutually agreeable. They would then take an interest in their ward. They should be allowed to live in or live out.

Why not make nursing a compulsory national service and make the period of it, eighteen months or one year, sufficiently attractive to make the maidens want to continue training or at least look forward to the sixty days' service later as "supplies" for holiday relief of the regular nursing staff? These are just a few points which I think could be further considered by those responsible for the recruitment of nurses.—I am, etc.,

Aberdeen. WINNIEFRED M. GRAY.

Admissions to Hospitals

SIR,—One hopes that a recent experience does not reveal the shape of things to come.

In an endeavour to get a patient with pneumonia into hospital (there being no one at home capable of nursing him) I 'phoned a local authority hospital—his area hospital—and was informed that they now received mental cases only. That is hospital A. I 'phoned hospital B, on the recommendation of A, and was told that they could not accept the case, as they were not receiving that day. I 'phoned hospital C, on the recommendation of B, and was told that it was not likely that they could accept and that all they could do would be to put the case on the waiting list, but that they would 'phone me back. In about an hour C 'phoned to say that hospital B, which had refused me, would take the case. To my protests at the delay and lack of liaison I was told that this was constantly happening since the grouping of hospitals had taken place. This I believe is correct, for in more than 20 years of practice in the same area I cannot recollect having spent one-quarter of the time in getting a patient admitted, nor can I recollect having heard the suggestion made that an acute case as this should be put on the waiting list.

In view of the negotiations in progress one feels that this sort of thing should be seriously considered *now*, and the pros and cons of grouping accurately assessed before the whole hospital system of the country is committed to such a plan.—I am, etc.,

London, N.6. W. LEES TEMPLETON.

Surgical Anatomy of the Vagina

SIR,—Students of gynaecology will be extremely grateful to Mr. Wilfred Shaw (April 12, p. 477) for having described the surgical anatomy and operations of the vagina in his characteristic lucid and masterly style. The terminology suggested for the various grooves and sulci cannot be improved upon except in the case of the "transverse vaginal sulcus," which, I think, deserves the nomenclature of "urethro-vesical sulcus" as being more definite, descriptive, and going well with the term "bladder sulcus" of Mr. Shaw. The terms "transverse" and "vaginal" are both quite superfluous because all the grooves described by Mr. Shaw, except the obvious "oblique vaginal folds," are transverse, and they are all situated on the anterior vaginal wall.

In the description of vaginal hysterectomy for severe degrees of uterine prolapse I feel that the name of A. C. Palmer has been inadvertently omitted. The technique independently devised by A. C. Palmer and described by him in the *British Medical Journal*, 1934, **2**, 899, and in the *Proc. roy. Soc. Med.*, 1937, **30**, 1353, though similar to that of Mayo and Franz, is not quite identical with it and lays emphasis on certain features which merited at least a passing mention of his name, especially when Mr. Shaw himself, in his *Textbook of Gynaecology* (1941), has associated Palmer's name with Mayo in the description of the operation.—I am, etc.,

London, W.C.1. B. S. SURTI.

Vitamin B_1 and Painless Childbirth

SIR,—My attention was recently directed to an article in the *Soviet News* (Jan. 10, 1947) entitled: "Painless Childbirth—a Promising Soviet Experiment." The following extracts present the main points:

"It has been observed that the urine of women in childbirth, even in cases where the ordinary diet includes a sufficiency of vitamins, contains an exceptionally small quantity of vitamin B_1. This suggests that the body's demand for this vitamin is stepped up during the childbearing process."

To determine whether deficiency of vitamin B_1 had any relationship to the pain experienced during childbirth, the Central Institute of Obstetrics and Gynaecology of the U.S.S.R. carried out an investigation in Leningrad in 1945 and over 900 painless births were achieved. Different routes of administration were tried:

"At present the usual procedure is to begin with an intramuscular injection of 60 mg., followed, if the pains recur, either by another smaller injection or by doses through the mouth at an interval of half an hour. . . . Relief from pain was felt within 10 to 15 minutes of the first injection. In nearly half the test cases, 40%, the pains were relieved during the whole process of birth. In 51.2% of the cases there was a prolonged alleviation of pain. In 3.2% of the cases the effect was of short duration. Only in 5.6% was no relief experienced. . . . The expectation that vitamin B_1 would not only relieve pain, but speed up the process of delivery, was based on such facts as that a deficiency of vitamin B_1 in the organism of a woman in childbirth was known to lead to a decrease in the formation of glycogen, resulting in the exhaustion of the muscular tissues. The introduction of the vitamin, therefore, by facilitating the accumulation of glycogen in the muscular tissue, would create a reserve of energy of extreme importance in parturition, which demands a big expenditure of muscular energy, often over a considerable period of time. The introduction of the vitamin does in fact speed up the process of delivery to a very marked extent: the average time is halved."

Confronted by these facts I decided to put them to the test. Ten consecutive patients admitted to the maternity ward were given vitamin B_1 during the first stage of labour. The dosage adopted was 50 mg. of the vitamin by intramuscular injection followed by 3 mg. orally at half-hourly intervals. There was no marked alleviation of pain in the first seven cases so the dosage was increased to 100 mg. intramuscularly in the remaining three.

Four of the patients said the injections had no effect on the pains, four were relieved for a short period (approximately one hour), and two stated that the pains became more severe after the injections. The increased dosage did not appear to have any different effect on the pains. There was an apparent decrease in the duration of labour after the vitamin was given in all cases, but this was impossible to assess accurately without controls. All the babies were born normally and were unaffected by the treatment.

This series of cases is too small to yield statistically significant results and no definite conclusions can be drawn. It was intended as a preliminary experiment before proceeding to a full-scale investigation with a controlled group of patients. Unfortunately I am unable to carry out this investigation, but would suggest, in view of the importance of analgesia in labour, that some other investigator continue this research in order to confirm or disprove the Soviet claims.—I am, etc.,

London, S.W.20. D. M. ZAUSMER.

Pethidine in Labour

SIR,—In her comprehensive article on pethidine in labour (April 5, p. 437) Miss Josephine Barnes touches on the effect of pethidine on the *duration* of labour. She suggests that to assess this accurately a controlled experiment is necessary, the drug being given to alternate primigravidae in labour.

While I was working in the Nuffield Department of Obstetrics and Gynaecology at Oxford, I undertook such an experiment with the help of Mr. C. Scott Russell, who was responsible for the statistical analyses. The patients selected were primigravidae of 38 or more weeks of pregnancy in the first stage of labour, and they were allotted to a pethidine group and a control group in rotation. On admission, the descent of the head and the dilatation of the os were determined. The first group were given pethidine, 100 mg., at once by intramuscular injection. This was repeated every four hours so long as sedation was required. No other sedative was used, though gas-and-air analgesia was allowed. The second group were given a mixture of tinct. opii and chloral, morphine, or heroin and "hebaral" according to requirements. They, also, were allowed gas-and-air analgesia.

When there were 13 patients in each group a pilot survey was carried out to see whether the experiment was likely to yield any useful information. The total duration of first and second stages was estimated, and the average for each group was calculated. The average of the pethidine cases was 20 hours as against 26 hours for the control group. An analysis of variance, however, showed that the variation within the groups was so great that the difference between the groups was nowhere near significance level.

The experiment was therefore continued in a modified form. The total duration of first and second stages obviously was not a good estimate of the effect of the drug, so in subsequent cases the time from the onset of treatment till the delivery of the baby was recorded. It was thought that useful information might be obtained by analysing the cases in such a way as to compare more accurately like with like.

Each group was subdivided into four categories according to the descent of the head on admission—high, engaged, mid-cavity, and deep. In each category cases were tabulated according to dilatation of the os (0–5 fingers) and age (under 25, 25-35, over 35). It was then fairly easy to select pairs, one from each group, that could reasonably be compared with each other. In selecting each pair I made certain that the weights of the babies were alike and also the mode of delivery—for example, a patient who had had a spontaneous birth was not compared with one who was delivered by forceps. By this means of selection 21 comparable pairs were available for study. They showed that from the time of commencement of treatment the labour of those patients having pethidine was shorter than in controls 10 times, longer than in controls 10 times, and exactly the same once. In fact, it was obvious from superficial inspection that there was no material difference in the two groups.

This experiment, then, did not justify any conclusion as to the effect of pethidine on the *duration* of labour. I record it only in order that others attempting to elucidate the point may design their experiments in such a way as to reach a more helpful conclusion.—I am, etc.,

London, E.1. ELIZABETH M. ROSE.

A Spinal Injury Centre

SIR,—As a recent importation into a mining area I hesitate in the face of greater experience, but I would appreciate the opinion of other general practitioners in such areas on the question of spinal injuries in the mines. I gather that such injuries are not uncommon as a result of rock and coal falls and usually take the form of compression fractures or spinal contusion. After such injuries, with laminectomy, etc., duly performed when indicated, the patient returns, only too commonly, to his own home an object of pity, invalid or semi-invalid, to exist on a pittance of compensation aided by public assistance. Eventually ascending urinary infection or ascending degeneration of the cord concludes his story, but this may be many years later.

I would suggest that there is a strong case for a spinal injury centre, on the lines of the Head Injury Centre at St. Hugh's, where such cases could be transferred as soon as they are fit to travel from the local hospitals. Here due attention could be given to mental as well as physical rehabilitation; the man could have the benefit of the best consultant opinion, orthopaedic and neurosurgical, and there would be no problem of shortage of accommodation. The project could deal with all industrial spinal injuries of major character, or, if the Coal Board should consider the problem as important as the provision of hair cream in pit-head baths, perhaps they would like to sponsor the idea for the injured miner.—I am, etc.,

Kinsley, near Pontefract. K. V. JACKSON.

*** An account of the miners' rehabilitation centre at Berry Hill Hall was given by E. A. Nicoll in an article entitled "Rehabilitation of the Injured" in the *Journal* of April 5, 1941 (p. 501).—ED., *B.M.J.*

POINTS FROM LETTERS

The N.H.S. Act

Dr. R. H. P. HICK (Bracknell, Berks.) writes: It seems to me that the general trend of the policy of the B.M.A. is a gradual veering round to acceptance of the Bevan Act. You will be doing a great disservice to your members if you do not fight it tooth and nail and encourage every member to back you up.

"Free Health Service"

Dr. LESLIE HARTLEY (Camberley, Surrey) writes: The public will not mind paying an extra shilling for their packet of cigarettes, as Dr. Dalton told them in his budget speech that it was to pay for the free Health Service. When the new Service comes into force on All Fools' Day next year, just before the budget, the jovial doctor will no doubt put a shilling on the pint also in Freedom's name.

"Rock-a-bye Baby"

Dr. A. P. DERHAM (Victoria, Australia) writes: I must with thousands of others congratulate you on producing the "blizzard" numbers of which I have received Nos. 4494 and 4495. In the latter there is an answer to a question which calls for comment: "*Q.*—Is it harmful to rock a child to sleep? *A.*—No." No answer could be more brief or dogmatic. A better answer would have been "Yes and No." The choice would rest on the question: "What kind of person do you wish the child to be?" For brevity I shall be as dogmatic as your "No" authority. A child is rocked to sleep because otherwise it cries or stays awake. A child may cry or stay awake for a variety of reasons: flea, safety-pin, wind, wet napkin, overstimulation, etc. Many of these can be diagnosed over the telephone—the most convenient way until we get television. After the first few occasions, however, a child usually cries because he finds that by so doing he can establish a certain power over his parents. He is fulfilling one of his fundamental instincts. If he is rocked to sleep he may become an Alexander, a Napoleon, or even a Winston Churchill, but he is more likely to become a querulous person, "hated as his age increases by his nephews and his nieces." If he is allowed to cry it out he may become a Shackleton, an Oates, or a Scott, but he will at least have learnt to make his first adjustment to life the hard way and will have gained a victory over himself instead of over his parents. A young mother once took her baby to a famous French paediatrist. She asked, "Doctor, when should I begin to train my baby?" He asked, "How old is your baby?" She replied, "Six weeks old." He replied, "Madam, you are six weeks too late." *Q.*—Do I really believe all this? *A.*—Yes and No.

Electric Convulsion Therapy

Dr. P. L. BACKUS (London, N.W.1) writes: Dr. S. M. Witteridge (April 12, p. 505) gives the necessary emphasis to proper procedure in electroplexy, and it is most timely and important. . . . As a gag I have adopted the use of two or three pieces of heavy stethoscope tubing about 2½ in. (6.3 cm.) long bound together and covered lightly with sterile gauze when in use. This allows a free airway for the passage of the oxygen into the posterior fauces. It has been my custom to use 5% carbon dioxide with pure oxygen, and the administration of the same is continued until the patient rouses sufficiently to reject the mask, or for at least three minutes.

Changing Medicine

Capt. D. M. SINCLAIR, R.A.M.C., writes: The following little historical note might give one food for thought. While glancing through the sixth (1905-6) edition of Osler's *Principles and Practice of Medicine* I came across this paragraph in relation to diabetes mellitus: ". . . glycosuria occurs. This may theoretically be produced . . . by functional or organic disease of the islands of Langerhans in the pancreas. These islands of cells probably produce a glycolytic ferment or body. . . ." The owner of the book, apparently rather progressive in outlook, has crossed out the above paragraph and inserted a marginal note: "There are no islands of Langerhans. They are merely alveolar changes in the pancreas. *Vide B.M.J.*, Sept. 29, 1906, Starling's article."

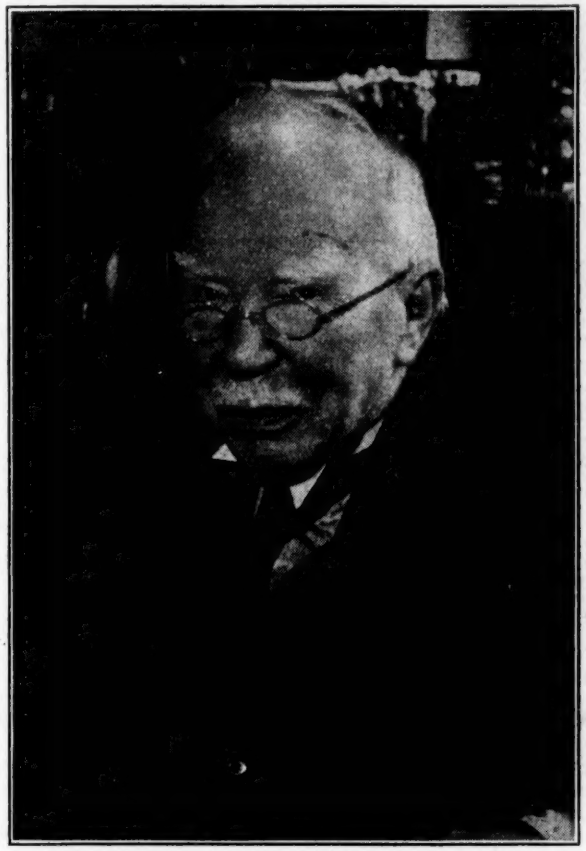
⁂ The marginal note refers to an unsigned book review on *Recent Advances in the Physiology of Digestion* by Prof. E. H. Starling which appeared in the *Journal* (Sept. 29, 1906, p. 781) and in which the following statement occurs: "The islets of Langerhans, of which we have heard so much recently, as the parts of the pancreas especially related to the production of the internal secretion concerned in the assimilation of glucose, and whose destruction has been said to be the cause of diabetes, turn out to be merely stages in the growth of pancreatic alveoli, all parts of the gland reverting to this condition as the result of activity, so that there is a constant formation and disappearance of these islets; the relation of the pancreas to diabetes remains an unsolved problem."—ED., *B.M.J.*

Obituary

SIR ALMROTH WRIGHT, K.B.E., C.B., M.D., LL.D., F.R.S., F.R.C.P.

Sir Almroth Wright died at his home in Pembroke Square, London, on April 30. He was in his 86th year.

A son of the Rev. Charles H. H. Wright, D.D., Almroth Edward Wright was born in 1861. His mother was the daughter of Nils W. Almroth, governor of the Swedish Royal Mint. Almroth Wright received his early education at Dublin University, where he took the B.A. and was awarded a gold medal in



Photograph of Sir Almroth Wright taken in 1940.

modern literature. He qualified M.B., B.Ch. in 1883 and, being awarded a medical travelling prize, was enabled to take up a studentship at the Inns of Court in jurisprudence and Roman and international law. Later he studied at the universities of Leipzig, Strasbourg, and Marburg before becoming a demonstrator of pathology at Cambridge University in 1887. While at Cambridge he was granted a Grocers' Company research scholarship. Two years later he went on to take the M.D. of Dublin, and accepted soon afterwards the position of demonstrator in physiology at Sydney University. Only three years later, at the age of 31, he became professor of pathology at the Army Medical School, Netley. At this time he had already done important work in devising a coagulometer for estimating the coagulation time of the blood, and in indicating for the first time the part played by calcium salts in the coagulation of the blood. His tenure of this chair lasted for ten years, for two of which he was also a member of the Indian Plague Commission. It was in the early part of this century that he became pathologist to St. Mary's Hospital. In 1908, with the aid of Lord Balfour, Lord Iveagh, Lord Justice Fletcher Moulton, and others, Wright founded the Inoculation Department of St. Mary's Hospital as a separate financial entity; he remained director of this until last year. The Inoculation Department rented from the hospital certain unused wards; these were fitted out as laboratories and so used

until 1934, when the generous contributions by Lord Iveagh and others enabled the present laboratories to be built adjoining the new Medical School. He was a founder member of the Medical Research Club.

Wright's pioneer work on immunization began in 1896, when, following the inspiration of Haffkine's inoculation of cases of cholera and Pfeiffer's inoculation of two cases of typhoid, he introduced the idea of immunization by means of vaccines made of killed bacteria (*Lancet*, Sept. 19, 1896: "On the Association of Serous Haemorrhages with Conditions of Defective Blood-coagulability"). In a series of papers on anti-typhoid inoculation he published one jointly with W. B. Leishman in the *British Medical Journal* of Jan. 20, 1900, under the title of "Remarks on the Results Which Have Been Obtained by the Antityphoid Inoculations." With S. R. Douglas he gave an account (*Proc. roy. Soc. Lond.*, 1903, 72, 357) in 1903 of experiments which showed the presence in the serum of substances (named by him "opsonins") which, as Bulloch puts it, "in some way . . . alter the microbe so that it falls an easy prey to the leucocytes." From this work Wright developed his "opsonic index."

In 1904 Wright published his *Short Treatise on Antityphoid Inoculation, Containing an Exposition of the Principles of the Method, and a Summary of the Results Achieved by its Application*—the first and perhaps the most important of the books he wrote. It was soon translated into French and German, and editions appeared in many other countries. His *Principles of Microscopy* appeared in 1906, and *Studies on Immunization and Their Application to the Diagnosis and Treatment of Bacterial Infections* was printed in this country and in Germany in 1909. Other books that bore his name marked different phases of his life and varying aspects of his many activities. In collaboration with Leonard Colebrook there was produced in 1912 a handbook for the medical research laboratory and the research ward, *Technique of the Teat and Capillary Glass Tube*—in its own way a classic. This was followed in 1914 by *Pharmaco-Therapy and Preventive Inoculation applied to Pneumonia in the African Native.* A product of his war experience published in 1915 was *Wound Infections and Some New Methods for the Study of the Various Factors which come into Consideration in their Treatment.* His work during the war of 1914–18 on the saline treatment of wounds ended in the Carrel–Dakin method. He contributed numerous papers to scientific journals throughout the world. In his *The Unexpurgated Case against Woman's Suffrage* he illustrated his anti-feminist outlook. Another example of his polemical ability was his rejoinder to Sir Watson Cheyne's advocacy of antiseptic procedures. Wright concluded by writing this: "I would invite them to the study of the psychology of obsession; and would have as many as follow the intellectually glorious calling of medicine hearken to that saying of Emerson: 'God has given to every mind a choice between truth and repose.'"

It was in the years 1914–18 that it became clear that Almroth Wright and his colleagues had altered the course of history. Enteric fever had taken a tragic toll in the South African War. Twenty years later, had treatment been the same, it is estimated that over 125,000 men in the British Forces alone would have died. Actually deaths from this cause during the whole of the war numbered only 1,191. Almroth Wright, who at the outbreak of war was principal of the Institute of Pathology and Research at St. Mary's Hospital and professor of experimental pathology at the University of London, served as a consultant physician in France; while at home, in the first two years of the war, the department he had created at St. Mary's Hospital provided sufficient antityphoid vaccine for the immunization of four and a half million persons—a figure which may be compared with his first large-scale inoculation of over three thousand soldiers in India, two years after he had arrived at his first definite conclusions on the subject of typhoid immunization on the basis of experiments worked out at Netley in the years 1896–7. From this work of Wright's vaccine therapy may be said to have originated. He believed that vaccine therapy had a future in the treatment of established infection and spent much time between 1901 and 1914 in pursuing this idea. During his last years Almroth Wright was engaged in publishing his scientific papers in a series of volumes and in completing his philosophical work on logic and belief.

In 1906 a knighthood was conferred on him, and he was made a Fellow of the Royal Society. Two years later, in 1908, he was awarded the Fothergillian medal of the Medical Society of London. At the International Congress of Medicine in London in 1913 he was awarded the Hungarian prize. He was created a Knight of the British Empire in 1918, having been made a C.B. in 1915. He valued perhaps most, however, the honour which was done him by the Royal Society of Medicine when he became its first gold medallist. It was through the gift of an anonymous Fellow of the Royal Society of Medicine that the Society was able to give a triennial gold medal open to medical practitioners throughout the world, and the donor expressed the hope that the first award would be made with special regard to medical services during the war. On Nov. 11, 1920, the President of the Society, Sir John Bland-Sutton, presented the medal for the first time to Sir Almroth Wright, whose address on this occasion was a general one on the conditions of medical research, in the course of which he pleaded for the institution of research work in hospitals by a staff not of clinical men but of men with clinical knowledge trained in methods of discovering immediate effects.

During and after the war the value of the work he had done for the allied Forces was recognized by the conferment of honours by France, by Belgium, and by Serbia. He was elected an honorary member of the Société Médicale des Hôpitaux de Paris in 1919, and the honorary M.D. of Paris was conferred upon him in 1924. He was an Associate Member of the Académie de Médecine de Paris, and a corresponding member of the Institute of France. He was made an Honorary Fellow of the Royal College of Physicians of Ireland and of the Royal College of Surgeons of Ireland. Dublin made him an honorary D.Sc. and an honorary Fellow of Trinity College. Belfast conferred its LL.D. upon him and made him an honorary Burgess of the City, and the University of Leeds made him an honorary D.Sc. At the Annual Meeting of the British Medical Association in Belfast in 1909 he was president of the Section of Haematology and Vaccine Therapy. Then again at the Centenary Meeting in London in 1932 he was president of the Section of Bacteriology. He had a further point of contact with the Association in 1927, when, in connexion with the Annual Meeting, the University of Edinburgh held a special graduation ceremonial and conferred upon him the honorary degree of Doctor of Laws.

It was on his seventy-fifth birthday that tribute was paid to him by his colleagues, when in the laboratory of the inoculation department of St. Mary's Hospital in March, 1936, Sir Henry Dale unveiled a portrait bust of him, the work of Mr. Donald Gilbert, and presented it, together with a small volume containing an engrossed address and the names of about 250 colleagues who had participated in the testimonial. Paul Ehrlich, Sir Henry Dale observed at the presentation ceremony, once said that he could carry out all the researches he wanted if he were given a supply of dyes and other chemicals, a handful of test tubes, a water-tap, and a bunch of blotting-paper. Almroth Wright, Sir Henry continued, was no more exigent in his requirements. A microscope, an incubator, some glass tubing, a few rubber teats, a little plasticine, and some "vaseline" were all that he needed in the way of apparatus. The material for his research was a few drops of human blood, which he obtained from himself, his friends, or his patients. "I sometimes think," Sir Henry added, "we should regard Sir Almroth Wright as one of the burglars of Nature's mysteries, fashioning the skeleton keys with his own skilful hands from the most homely material, and then using them, with the touch of genius, to force the intricate locks."

Almroth Wright said the praise he valued was the praise of his compeers, and he quoted what Metchnikoff had said of him: "He is the sort of man who has very good original thoughts—but he has also many thoughts which are only original." And he concluded his acknowledgment of the presentation with a quotation from Bunyan—from Mr. Valiant-for-Truth, who stood at the brink of the river of death looking back over the labour and toil of his life: "I leave my sword to him that shall succeed me in my pilgrimage, and my courage and skill to him that can get it."

[Press Portrait Bureau]

Mr. G. Bernard Shaw writes: In the obituary notices, and especially in the broadcast, too much has been made of Wright's early experiments in immunization and too little of his later work.

In my opinion one of his most illuminating and pregnant utterances was the single sentence he interjected at a lecture delivered by me at his invitation in St. Mary's Hospital. I was calling attention to the reckless crediting to bacterial inoculation of results though all the available controls pointed to sanitation as the real cause. Wright's comment on the spur of the moment was: "I believe the effect of sanitation is aesthetic."

Little has been said of his treatment of wounds in the 1914–18 war by salines, his advocacy of which involved a contemptuous debunking of Jenner and Lister as scientific immunizers, and his explicit statement that his study of salines was a reduction to scientific essentials of the rude poultices of soap and sugar used by old wives in Irish villages.

Nothing has been said of his efforts to excogitate a scientific method of reasoning, and his invention of new and necessary words. To these he attached great importance, knowing that our scientific authorities are strong in facts but weak in logic.

The net effect of the obituaries is to underrate Wright even more than he underrated himself.

Sir Henry Dale writes: It is early yet to attempt a prediction as to the permanence of many individual items of Almroth Wright's large and varied output during his very long career of research. He himself showed in his later years what might have seemed, at least at first sight, a curious inconsistency of attitude with regard to his own scientific publications. He had, on the one hand, arranged for the republication of all of them in collected form, believing doubtless that, even where their results had been overtaken by advances made from different angles, they had in their own way and time contributed significantly to the progress of knowledge. On the other hand, with his ingenious curiosity undimmed by age, and a mind still remarkably open to the interest of novelty, he seemed to be eagerly searching for and finding evidence which called for revision of some of his earlier ideas, and preparing to jettison them with something like gusto. Wright was a man whose methods of work and ways of thinking, together with his attractive and stimulating personality, evoked a rare intensity of devotion and enthusiasm in his co-workers; on the other hand, his findings and his presentation of them were apt to excite opposition and dispute—partly, no doubt, because he himself so enjoyed the clash of opinion and the cut and thrust of argument, with a well-grounded confidence in his own prowess. His interests and activities ranged widely over the years, the one unifying character in all his researches being, perhaps, their concern with the blood and its constituents, and their various functions and properties—coagulation in his earliest years of research, and, for most of his life, the different factors and manifestations of immunity and the ways of modifying them. Probably the future will give highest rank, among his contributions to pathology and practical medicine, to his development of active immunization and his vigorous advocacy of its applications at a time when the possibilities of passive immunization with sera was attracting so predominant a share of the general interest. His immunization against the enteric bacilli with killed cultures was the first and immensely important outcome; some of the later attempts at similar immunization, with heat-killed cultures of other pathogens, have had less success; but the principle of supplementing passive by active methods of immunization is still growing in importance, and Wright was the most influential and consistent of its pioneers and early advocates.

Those of us who knew Wright well and had the great privilege of his friendship will retain, as the dominant impression of him, the picture of his figure seated all day and far into the night at his laboratory bench, working with tireless interest, and always with his own hands and eyes. He used the simplest appliances—glass tubing, a gas burner, a dab of plasticine, a handful of rubber teats—but, like his friend Paul Ehrlich, Wright made himself a veritable virtuoso of the limited gamut of his chosen instrument. He had an artist's, a fine craftsman's joy in his work, and he left it only at the compulsion of physical need. He still held up that example of devoted and intensely personal research at an age long past that at which most men feel the need of relaxation and rest. One has the feeling that something like an epoch in research comes to an end with his death.

Dr. John Freeman writes: Soon after the Boer War, Dr. Almroth Wright came to St. Mary's Hospital as pathologist; he had just resigned from his Army professorship as part of the fight to get adopted his prophylactic inoculation against typhoid. Lord Haldane's insistence on a knighthood, which Wright genuinely regretted, was another part of the same plan.

Wright soon made his presence felt at St. Mary's. His personality seemed like a draught of wine to the young men of that day: his freedom of thought, freedom of manner, and freedom of language, while distasteful to the more orthodox elders, was a heady but stimulating brew for us youngsters. His mind seemed free from conventional assumptions. He was always ready to consider any proposition, however unlikely and by whomsoever presented, so long as it was put forward honestly and was backed logically. He hated any suggestion of pomposity. "Dignity is a mysterious gesture of the body designed to hide deficiencies of the mind," he quoted. "Except ye become as little children, ye shall not enter into the Kingdom of *Science*," he misquoted to anyone trying to bludgeon him with authority. If he thought it necessary he could be ruthless; he had not gone to Trinity, Dublin, for nothing, and he loved a good fight. "Unless the physicians soon learn to do something, they will be reduced to a position little better than that of the head nurse," he declaimed at his first public lecture at St. Mary's, and two physicians walked out in a huff.

Though he had a short and rough way with the pompous, he was always gentle with hospital patients and with all who were trying to work. Countless stories could be told illustrating this: here is one. We were all sitting looking down our microscopes when a fashionably dressed doctor quite unknown to any of us walked in holding his glossy top hat in one hand and his gloves and malacca cane in the other. He announced with satisfaction that he had just been appointed Physician in Ordinary to one of the Crowned Heads of Europe and he would like to know if we had any hints of new treatment that could help him. Wright looked up from his microscope, said reflectively, "No, I don't think so," and went on with his work again. While the resplendent dandy was still standing nonplussed in the centre of the laboratory, a navvy in hobnail boots and corduroy trousers, nervously twisting his cap in his hand, came in and said in a husky voice, "I didn't ought be rights to come in here, Guv'ner, but could one of you gentlemen—?": Wright at once bounded to his feet, saying, "What may I have the pleasure of doing for *you*, my friend?"

Wright soon began seeing out-patients in his laboratory; their numbers mounted to a flood which blocked stairways and passages. Later he bargained for hospital beds to be under our control for special investigations—the "Almroth Wright Wards" as they are now called. It was necessary to keep on seeing patients because we all needed the "pain in the mind" which came when looking impotently at a little understood case; he insisted that we all needed that galling spur to complacency.

Forty years ago he asked that we should put on his tombstone a quotation from Emerson's essay on intellect: "God offers to every mind its choice between truth and repose." And he used to add, peering at you over his spectacles and with his eyebrows twitching, "Repose is the more fashionable." He constantly reiterated that we needed this "pain in the mind"; it was what drove him to furious work. In his strength he would work in his laboratory regularly until 3 a.m., and often this stretched until 5 or 7 a.m. and he was generally one of the last to leave.

He was curiously ascetic in his habits. "Art is a whore with whom I played in my youth," he said. A good dinner he denounced as a "voluptuary pleasure," and I once made him really angry by pressing on him a glass of benedictine—which I knew he loved. On the other hand, he took enormous pains to get exactly the colours he wanted in his beloved flower garden at Stoke Poges; for him that was *not a* voluptuary pleasure. He was chary of listening to music because it affected him too much, and made him "give at the joints."

Yet he could hardly have enough of poetry, and Dante and Milton were his poets: during tedious motor journeys in the first great war he would quote Milton to himself from memory—his mouth silently muttering for an hour at a time. I only once got him to go to a theatre: the play was *Man and Superman*, by his friend Bernard Shaw. Later, of course, Shaw put him into *The Doctor's Dilemma*. Everyone recognized him as the scientific Ridgeon; but I have always thought he was as much like the Irish Sir Patrick Cullen, and that Shaw had split Wright into the two characters—one ruthless and the other so very lovable.

If Art was a whore, Philosophy was a beloved mistress from whom he never wished to break free, though Lord Balfour used to beg him to give her up. When I first went to live in his house, forty-five years ago, I found a much corrected galley proof headed "The Physiology of Belief"; that name has changed many times since, but he was still working at it up to the last days of his life. Almost his last conscious act was to read a recently written bit to his own son.

Dr. ALEXANDER ASHER, of Findhorn, Morayshire, died on April 15 at the age of 82. Dr. Asher was the son of an Inverness merchant. He was educated at Inverness Academy and Edinburgh University, obtaining his medical qualification there in 1888. He spent his professional life in Thurso, where he built up a large practice. A man of great integrity, he earned the confidence and trust of his patients and was highly respected by all who knew him. In manner he was quiet and unassuming, and one had to know him well to appreciate fully his many excellent qualities. He became a member of the British Medical Association in 1899, and in the work of the Association he found his main hobby. He was honorary secretary of the Caithness and Sutherland Division from 1915 to 1934, and it was in large measure due to his devoted efforts that the work of the Division in a scattered and difficult area was carried on so efficiently. He also acted as president of the Northern Counties of Scotland Branch, and for four years was a member of the Scottish Committee. His activities were not confined, however, to medical matters. His sterling qualities were recognized in his election for a term as provost of Thurso. He was a justice of the peace for the County of Caithness, and was also elected a member of the county education authority. In his later years he was much troubled by failing eyesight and he retired several years ago to the village of Findhorn. He leaves behind him a record of faithful and conscientious service to his fellow doctors and to the community as a whole.

Dr. JOHN MORLAND SMITH died on April 16 at the early age of 32. Dr. Morland Smith was a student of Middlesex Hospital. He took the Cambridge M.A. and the Conjoint Diploma in 1940, and the D.A. a year later. For a short time he was junior resident anaesthetist at the Middlesex before being appointed senior anaesthetist at the Ministry of Pensions Hospital at Stoke Mandeville. His home was in Bournemouth.

A colleague writes: In the untimely death of Dr. Morland Smith the Plastic Surgery Department of the Stoke Mandeville Hospital (Ministry of Pensions), Aylesbury, has sustained a loss from which it will be difficult indeed to recover. He was the most important and indispensable individual member of the team which has worked hard and harmoniously there throughout the difficult war years. "Johnnie," as his likable personality made him known to us all, had a real flair for his specialty, and those of us who watched his progress with fatherly interest predicted for him a position of high eminence among this country's anaesthetists in the spheres of both practice and research. To observe the care and gentleness which he expended on the intubation of infant patients requiring operations for the repair of congenital defects of lip and palate was to realize that here was a true artist at work. Never content with anything merely "good enough" he became a real adept at providing that light degree of anaesthesia which, whilst ample for the surgeon to carry out even lengthy operations without embarrassment, left him with a child exhibiting active reflexes when the work was finished. In this way he robbed our work on infants of all anxiety. He was one of those anaesthetists who always saw his patients on the day before operation and followed their progress after operation in his desire to discover faults and devise improvements. He kept careful records of the many hundreds of patients he anaesthetized, and it is a tragedy indeed that these may never now be analysed. "Johnnie" was on the eve of marriage and of military service and our sympathy for his mother and fiancée is deep and sincere.

Medico-Legal

MENINGITIS FOLLOWING SPINAL ANAESTHESIA

[FROM OUR MEDICO-LEGAL CORRESPONDENT]

Mr. G. G. Voller, of Southsea, fractured the shaft of his right femur when playing football in April, 1944. He was then aged just over 18. He was taken to St. Mary's Hospital, Portsmouth, which is maintained by the corporation as a public hospital. After three weeks the fracture had failed to unite and an operation was performed. Earlier injections of "evipan" had not given enough relaxation, and so a spinal injection of "nupercaine" was given. The operation was taking place, for convenience, in the ward, but the syringe and needles came from the operating theatre. Shortly afterwards the patient developed meningitis, which left him with permanent paralysis of both legs and incontinence of urine. Suing through his father, he claimed damages against the corporation, Dr. R. J. Hamer Hodges, a resident medical officer, Mr. A. Gordon Ord, the consultant orthopaedic surgeon who performed the operation, and Dr. S. F. Hans, the senior resident medical officer, who acted as anaesthetist.

All the defendants denied negligence. The corporation denied liability for the acts of the medical practitioners, and Dr. Hans pleaded that since the action against him was not started within twelve months from the injury he was protected by the Public Authorities Protection Act, 1934, and the Limitation Act, 1939. Mr. Voller also pleaded that no consent to the giving of the anaesthetic had been obtained, but this point was not pursued. The case turned on the propriety of the technique of sterilizing the syringe and the Howard Jones needle.

Mrs. V. F. Spacey, formerly a nursing sister, giving evidence for the defence, said that immediately after use a syringe was rinsed with water, soaked in pure lysol and then in methylated spirits, and finally placed in a glass container with formalin tablets. So far as she knew, the normal procedure was followed in the present case.

Mr. E. Hume Kendall, a consulting surgeon, said that he considered these steps inadequate. Complete protection could be given only by sterilization by superheated steam in an autoclave. He agreed that the risk was small, but recalled reports of a number of cases in the medical journals. The method described was similar to that in general use at the time, but since this accident he himself had given instructions for sterilization by autoclave. He thought that infection could not be introduced into the spinal canal without a breach of technique.

Dr. R. C. Macpherson, formerly medical superintendent at St. Mary's, said that the hospital had used an autoclave since 1917 but that none of the syringes in use in 1944 would have stood up to the heat. Up to 1946, when he had retired, the autoclave was still not used there for sterilizing syringes.

Dr. R. W. Cope, a consultant anaesthetist, said he was satisfied that Dr. Hans had administered the anaesthetic in accordance with the approved practice. In a number of similar cases search had been made for breaches of technique but none could be found. He quoted an authority who reported only two cases of meningitis in more than 14,000 injections. He thought airborne infection the most likely source in this case and could not see any fault in the aseptic technique of the hospital.[1]

Judgment

Mr. Justice Birkett, giving his reserved judgment,[2] said that he found no evidence against any of the defendants in the treatment of the fractured femur, in the decision to give a spinal anaesthetic, in the treatment of the patient after meningitis had been diagnosed, or in the giving of the injection in the ward instead of the theatre. He found that the meningitis was the direct result of the spinal injection. Bacteriological examination of the cerebrospinal fluid had revealed the presence of *Ps. pyocyanea*. He accepted the evidence of Mr. Hume Kendall that, as the bacillus entered the patient's body from without at the moment of the injection, there must have been some breach of the aseptic technique at the hospital. In this connexion he referred to a paper by Dr. Frankis T. Evans and a paper by

[1] *Portsmouth Evening News*, March 17 to March 26.
[2] *The Times*, April 30.

Dr. Michael Kremer on meningitis after spinal analgesia which appeared in the *British Medical Journal* of Sept. 8, 1945. He was satisfied that the surface skin of the patient was properly cleansed before the operation, and that Dr. Hans had prepared himself in the approved way by "scrubbing up" and had done all that was required. The only remaining source of infection was in the apparatus used for the operation. For all of this the nursing staff of the hospital would be responsible, and for any failure by that staff, its servants, the corporation would be responsible according to the decision of the Court of Appeal in *Gold* v. *Essex County Council*.[3]

He was satisfied that the aseptic technique used at the hospital in 1944 was adequate in the light of the knowledge available at the time, and that there must have been some breach of that technique. The evidence given on behalf of the hospital on that point did not inspire him with great confidence, and the amount of confusion, forgetfulness, and carelessness which had existed was very disturbing. He was satisfied that the origin and sources of the infection were within the control of the hospital and the nursing staff, and that the infection would not have arisen without negligence on the part of the hospital in the care and control of those sources, and must have been due to a breach of the aseptic technique. He could, however, find no evidence that the medical practitioners had been negligent. He accordingly gave judgment in their favour but against the hospital. In the matter of damages, he said that no money could compensate the patient for the terrible disability from which he suffered, and he awarded £12,000 with costs. He granted a stay of execution in view of an appeal.

The defence of Mr. Ord and Dr. Hans was undertaken by the Medical Defence Union, whose solicitors, Messrs. Hempsons, instructed Mr. Milford Stevenson, K.C., and Mr. Bristow for Mr. Ord, and Mr. C. R. Havers, K.C., and Mr. H. C. Dickens for Dr. Hans.

Comment on this case must be deferred until it is known whether or not there is to be an appeal.

HOSPITAL'S LIABILITY FOR HOUSE-SURGEON'S NEGLIGENCE

In the Portsmouth case, as the doctors had not been negligent, the question of the corporation's liability for their doings did not arise. In another recent case, however, it has arisen in an acute form.

In our issue of April 5 (p. 472) we gave a short account of an action in which a widow was awarded damages against the Hertfordshire County Council in respect of the death of her husband from an injection of cocaine given in mistake for procaine. Mr. Justice Hilbery found that the surgeon, the student house-surgeon, and the pharmacist had been negligent and held that the corporation was liable for the negligence of the house-surgeon but not of the operating surgeon. The full report of the judgment[4] is of interest and importance, for it sets out clearly the present state of the law governing the liability of hospital governors for the acts of their medical staff and carries the law a stage further in development since the Court of Appeal decided in *Gold* v. *Essex C.C.*[5] that a hospital is liable for the negligence of its nursing and medical auxiliary staff in all matters, including those involving professional skill. Until that decision it had been supposed, on the authority of the judgments in *Hillyer* v. *St. Bartholomew's Hospital*,[6] that the hospital's liability covered only "ministerial or administrative duties, such as . . . the summoning of aid in cases of emergency, the supply of proper food and the like," and stopped short of duties involving professional skill. The present judgment establishes (if it is not reversed on appeal) that hospital governors may also be responsible for the mistakes of a resident medical officer. This is the first decision that has ever held (though the House of Lords came near to it in *Marshall v. Lindsey C.C.*[7]) that a qualified medical practitioner can in the course of his professional duties be the servant or agent of a hospital or other employer. It had previously been held[8] that the managers of a hospital merely enabled patients to meet skilled medical practitioners and did not themselves profess to treat patients or pretend that they had knowledge of treatment.

The judge stressed the uncertainty of the law and was conscious that he was exploring new ground. He pointed out that before *Gold's* case it had been generally accepted that the test was whether the hospital officer was performing his duties under a contract for services or a contract of service. If he was working under a contract of service, the hospital was liable, but if under a contract for services as a professional man, it was not. Several decisions have made it clear that a servant, as opposed to an independent contractor, is a person who is subject to direction and control as to the manner in which he shall do his work. The house-surgeon for whose negligence the Hertfordshire Council Council were held liable was a woman student in her last year who had passed some of her final examinations, including that in pharmacology. She was employed as a whole-time resident medical officer on terms set out in an appointment form. The case turned on the obligation that hospital authorities assume in law towards a patient who comes to them for admission and treatment. Lord Greene, Master of the Rolls, said in *Gold's* case that once the obligation is discovered, a person accused of a breach of it cannot escape liability because he has employed another person to discharge it on his behalf, and that this is equally true whether or not the obligation involves the use of skill or is one which the governors could never perform themselves. He went on to say: "So far as consulting physicians and surgeons are concerned, clearly the nature of their work and the relationship in which they stand to the respondents [the corporation] preclude the drawing of an inference that the respondents undertake responsibility for their negligent acts. The same may be true of the house-physicians and -surgeons, but their case is not relevant to the present inquiry and I say nothing about it."

The position of a resident house-surgeon was therefore left open for decision. Mr. Justice Hilbery took the view in the present case that part of the amenities which the hospital offered to patients was the presence at all times of a resident medical officer, and that his acts done in the course of treatment were acts for which the hospital was responsible. This view, he thought, accorded with the basis of the decision in *Gold's* case, and was the reason why he held the hospital responsible for the house-surgeon's mistake.

The hospital's position with regard to the operating surgeon was, he considered, quite different. That surgeon was, it was true, not in the same situation as a consulting surgeon, who, according to Lord Greene's dictum in *Gold's* case, does not involve the hospital in liability for his negligence. The judge also found difficulty in the fact that the surgeon had signed a form which spoke of his employment as a temporary part-time employee undertaking to attend on certain hours for a given basic salary. The judge was clear that these were the terms of an employment and was very doubtful whether the hospital was not also responsible for this surgeon's negligence. On the whole, however, he thought that the surgeon's position was such that the authorities could not in any way control how he was to perform his duties. They could not even say what he should or should not do; they could not order him to do an operation, and still less could they say how he should do it. The same was not true of the house-surgeon; to a very great extent the hospital authorities could say how she should perform her work, and indeed did so under a set of regulations which they intended to be binding on her, though these had not been brought to her attention in a way which would make them binding. The hospital was therefore vicariously responsible for the house-surgeon's but not for the surgeon's negligence.

Points of Interest

This decision obviously bristles with difficult and interesting points. The negligence of the house-surgeon was committed in the course of an act which required relatively little professional skill; she made a mistake in transmitting to the pharmacist the surgeon's prescription for an anaesthetic mixture. Would the hospital, one wonders, have been liable if she had been negligent in performing a surgical operation? Although the hospital authorities could possibly have ordered her to perform an

[3] 1942. 2 All E.R. 237.
[4] 1947. 1 All E.R. 633: *Collins* v. *Herts C.C.*
[5] 1909. 2 K.B. 820.
[6] 1942. 2 All E.R. 237.
[7] *Marshall* v. *Lindsey C.C.*, 1937, A.C. 97.
[8] *Evans* v. *Liverpool Corporation*, 1906, 1 K.B. 160; *Scottish Insurance Commissioners* v. *Edinburgh Royal Infirmary* (1913) S.C. 751; and others.

operation, it is not easy to see how they could control the manner in which she performed it but not the manner in which the visiting surgeon performed the same operation. The fact that she was not qualified and registered was not material to the judge's decision, and so if this stands it will establish the liability of hospital governors for the negligent acts of qualified medical practitioners in certain circumstances. Exactly what those circumstances are, and whether the test will be clearly and definitely that of control by the employer, remains obscure.

For instance, if in the Portsmouth case the resident anaesthetist had been found negligent (which he was not) would the corporation have been liable?

A less important but still interesting point in the same case concerned the apportionment of the damages between the county council and the surgeon under the Law Reform (Married Women and Tortfeasors) Act, 1935. Before that Act no contribution had been allocable between tortfeasors; each wrongdoer had been severally responsible for the whole of the damages. That Act, however, provided that "the amount of the contribution recoverable from any person shall be such as may be found by the court to be just and equitable having regard to the extent of that person's responsibility for the damage." If, said the judge, the sentence had stopped at the word "equitable" it would have plainly meant that the court should have the fullest discretion to distribute the damages according to the varying degrees of culpability of the tortfeasors. It is quite a different matter if the court has to decide the extent to which the negligence of one party or the other was causal in bringing about the damage. In the present case the hospital was negligent right up to the injection and even after it; at the same time the surgeon had the duty of checking to see whether what he injected was what he had ordered. He could have done this up to the last moment. The judge therefore felt quite unable to do otherwise than direct that the hospital and the surgeon should share equally in the responsibility and the contributions.

Medical Notes in Parliament

SCOTTISH HEALTH SERVICE BILL

In the House of Lords, on May 1, Lord MOLLISON moved the Second Reading of the National Health Service (Scotland) Bill.

He said the discussion on the Bill revolved around the ways of achieving an object about which there was little dispute—a comprehensive health service making every kind of health provision available for every member of the community. The case for an overhaul of Scotland's health service was similar to the case in England. The divergences between the two Bills reflected differences between conditions south of the border and conditions in Scotland. Under this Bill a family doctor was to be available for everybody, and in all parts of the country there must be means for securing that the distribution of doctors was not so uneven that some areas got a much poorer service than was generally provided. The Bill did this by abolishing the sale of medical practices and setting up a mainly medical body—the Scottish Medical Practices Committee—with power to forbid a doctor to enter practice in the public service in an area where there were sufficient doctors.

The system of remunerations was to include a basic salary which could be varied to attract doctors to areas where their services were most needed. Such an arrangement resembled the system which had been in operation in the Highlands and Islands of Scotland for the past thirty years. In the last generation there had been a trend away from the individual doctor working in isolation towards the partnership system. Along these lines the Government sought to foster the development of general practice. Doctors would be encouraged to work in groups and would be provided with premises designed for the purpose. These premises were the health centres of the future and in Scotland the Bill placed responsibility for providing health centres directly upon the Secretary of State. It authorized him to delegate his functions in this respect to local authorities, but he did not intend to do so in the early years of the new service. Responsibility for the local administration of the family doctor service would be entrusted to executive councils composed as to one-half of professional representatives.

The transfer of hospitals from the local authority field would diminish the direct interest of local authorities and of medical officers of health in the treatment of disease. In future their most important health function would lie in the social and preventive side of health work. In Scotland to-day there were more than 250 hospital authorities, and the result was overlapping, unnecessary competition, and gaps in the service provided for the patient. There was general agreement that for the future the hospitals needed to be welded together into a single hospital service organized on a regional basis.

Regional Areas

It was clear that local authorities could not be entrusted with responsibility for running the new service, and the duty of providing it should be placed upon a minister responsible to Parliament. The Government therefore proposed that all existing hospitals should be transferred to the Secretary of State for Scotland. Administration was to be entrusted to a special local and regional organization. Regional hospital boards were to be established as agents for the Secretary of State, who contemplated that five would be set up in Scotland, based upon Edinburgh, Glasgow, Dundee, Aberdeen, and Inverness. Preliminary consultations were in progress about the boundaries of the areas to be covered by each board. The grouping of hospitals under boards of management would be settled by the regional boards themselves. In England certain hospitals were to be designated as teaching hospitals and for them special boards of governors would be appointed who would be directly responsible to the Minister. In Scotland the Government proposed that all hospitals should come within the field of the regional boards, but that the special position of hospitals in which clinical teaching was carried on should be recognized by inclusion in their boards of management of members nominated by the university concerned and by the teaching board. The reason for this difference was that although the number of hospital beds in Scotland was only about one-tenth of the total for the United Kingdom, Scotland was training about one-third of the total number of medical students. The Scottish Bill placed a duty on the Secretary of State to provide facilities in the hospital service for the teaching of medicine. Responsibility for the conduct of teaching would continue to rest with the universities, who were given a special position in the proposed hospital organization. These proposals had been worked out by the Secretary of State in consultation with representatives of the Scottish universities. The universities were reasonably confident that the provisions of the Bill would enable them to discharge their teaching responsibilities.

In the treatment of voluntary hospital endowments the Secretary of State had followed a plan adopted not long ago for educational endowments and the Bill proposed a Hospital Endowments Commission. The Bill set up a Scottish Health Services Committee with standing advisory committees. These would provide the Secretary of State with expert advice on every aspect of the Health Service, and they would have power to offer that advice on their own initiative.

Direction and Distribution

Lord ROSEBERY said that in the Bill the Secretary of State for Scotland took on himself far more power than was necessary. He was glad, however, that there would be no *ex officio* officers of the Scottish Health Services Council. The Bill went a long way to destroy the independence and prestige of the teaching hospitals. Contrary to the English precedent the staffs of these hospitals were to be nominated by the regional board. That was an unnecessary degradation of the governors of those hospitals. He hoped the Government would relent, so that the hospital staffs would be directly under the hospital management. Clause 35, which dealt with the distribution of medical practitioners, was totally unnecessary in regard to Scotland. Whatever the case might be for direction in England and Wales there was no such case in Scotland. If the service was made free it would attract doctors to the centres of heavy population where the highest reward would follow the largest practices.

He saw no reason why Clause 36, prohibiting the sale of goodwill, should be put in to make a further criminal offence. The restriction on the sale of his house by a doctor to another doctor was outrageous and the Clause was practically unintelligible to the layman. It imposed new crimes on doctors who had not the guilty mind which in nearly every crime on the statute book was necessary to a conviction. He hoped the Government would go once more into this Clause and see if they could make it fairer to the medical practitioner. He thought that the appeal from the judgment of a tribunal against a doctor should be to the Court of Session and not to the Secretary of State.

Results of the Plebiscite

Lord SELKIRK said the Bill had not been welcomed wholeheartedly by the medical profession, or by many of the boards of governors of hospitals. In the voting which took place in

Scotland on this subject 55% voted against coming into the scheme and 45% were in favour of it. A regional system of hospitalization was inevitable in Scotland, but the position of the teaching staffs should be safeguarded, and at present it was not. The universities were profoundly anxious. They did not even know if they could appoint their own professors of surgery.

The Duke of MONTROSE said that deaf persons wished to be specifically included in the Bill.

Lord TWEEDSMUIR said there were eighty Clauses in the Bill, but he could not find anywhere a definition of "a proper distribution of doctors."

Replying to the debate, Lord MOLLISON said the reception given by the House to the Bill had been beyond his expectations. He was advised that while the staffs of the hospitals would have their contracts with the regional board, all but the senior members of the staff would be appointed by the board of management of the hospital, and this board would also have a big say in senior appointments.

With regard to hospital endowments, the Commission would be able to place an endowment with the hospital that provided the services. This Bill was based on medical practice by practitioners registered under the Medical Acts. The question of including unregistered practitioners would need amendment of those Acts. But registered practitioners were not restricted in their methods of treatment, and private arrangements were not affected by the Bill. The supervisory functions hitherto exercised by the Board of Control in relation to mental hospitals and mental deficiency institutions would in future rest with the Secretary of State. The Board would continue to exercise all its existing functions relating to the liberty of the subject, and to the interests of the patient as an individual, and would also supervise private mental institutions not taken over into the new hospital service. The medical members of the General Board of Control, and also the medical officers employed by the Board, would at the same time hold appointments as officers of the Department of Health. Under the Bill it would be possible for deaf people not only to be treated for deafness but to be supplied with hearing aids. The deaf-aid apparatus with which the Government was experimenting was not yet ready. He agreed that the medical services in Scotland compared favourably with those in any part of the world, but the health of the people in Scotland did not compare favourably with that of people elsewhere. The Bill was an attempt to apply in an organized way in their own country the outstanding medical attainments of the Scottish doctors.

The Bill was read a second time without a division and was committed to a committee of the whole House.

Streptomycin.—On April 21 Capt. JOHN CROWDER asked the Minister of Health if he would make a statement regarding the clinical trials of streptomycin organized by the Medical Research Council. Mr. BEVAN said the trials were in progress and it was not yet possible to foresee the outcome.

Silicosis.—Mr. D. J. WILLIAMS, on April 22, asked the number of applications for certificates received by the Silicosis Medical Board from coal-miners in South Wales. Mr. JAMES GRIFFITHS replied that during January to March, 1946, 2,312 applications were received and 2,424 cases were dealt with by the Medical Board, of which 1,230 were certified to be suffering from pneumoconiosis. The corresponding figures for 1947 were: applications received, 1,520; cases dealt with, 2,545, of which 840 were certified. Further steps were taken at the beginning of this year to strengthen the staff of the Silicosis Medical Board in South Wales when six new appointments were made, two of them to fill vacancies caused by resignation. There were now fifteen doctors attached to the Board in South Wales as compared with eleven a year ago and eight two years ago.

Indian Medical Service.—Mr. ATTLEE announced on April 30 that the Government of India had informed His Majesty's Government that they were anxious to avoid the loss of experienced officers. They had stated that they were prepared to give to those members of the Secretary of State's Services who continued to serve under the Government in India the same terms as to scales of pay, leave, and pension rights, with safeguards in matters of discipline as hitherto. His Majesty's Government had authorized the Viceroy to announce that they accepted the obligation to see that European officers and certain Indian officers should receive compensation for the loss of their careers and prospects consequent on the transfer of power. They undertook also that the members of the Secretary of State's Services in India who retired would be secured in their rights to the leave then due to them. Opportunities would exist for further Government service for many of those who became entitled to compensation. A White Paper which was issued after the Prime Minister's announcement stated that His Majesty's Government accepted a similar obligation to the Indian Medical Service.

Rights of the Subject.—The second reading of the Preservation of the Rights of the Subject Bill is set down for May 15 in the House of Lords. This Bill was introduced by Lord READING on April 24.

Naturopaths and Panel Patients.—Mr. HOUSE, on May 1, asked if the Minister of National Insurance had considered the case of a panel doctor at Birmingham influencing the non-payment of national health benefit to a Mr. Buckingham, and removing Mr. Buckingham's name from the list of his panel patients because the latter, immediately following an accident, attended Mr. Oldham, a qualified naturopath, and refused to follow the treatment the panel doctor subsequently prescribed. Mr. House suggested an alteration of the regulations to allow naturopaths to certify for National Insurance sickness benefit. Mr. STEELE replied that sickness benefit was only payable on proof of incapacity for work. In considering whether this condition was satisfied in a particular case Approved Societies were not tied to the form of evidence they could accept. Mr. House had been advised as to the steps Mr. Buckingham should take if he wished to pursue his claim for sickness benefit.

Medical News

A sessional meeting of the Royal Sanitary Institute will be held at 90, Buckingham Palace Road, London, S.W., on Wednesday, May 14, at 3 p.m., when a discussion on "The Control of Smallpox" will be opened by Dr. W. H. Bradley.

The annual general meeting of the Westminster Hospital Ladies Association will be held at the Queen Mary Nurses' Home of the hospital on Wednesday, May 14, at 3 p.m., with the Duchess of Westminster in the chair. The speaker will be the Dowager Marchioness of Reading, chairman of the Women's Voluntary Services, and the secretary of the hospital will give a short talk on "The Future Outlook."

A dinner and dance has been arranged by Queen's University Club, London, at the Dorchester Hotel, W., on Thursday, May 15, at 7.30 for 8 p.m. Members who have not received notices of the above should communicate with the honorary secretary, at 101, Harley Street, London, W.1.

The next quarterly meeting of the Royal Medico-Psychological Association will be held at Barnwood House, Gloucester, on Thursday, May 15, at 10.15 a.m., when, following the business meeting, papers by Dr. E. L. Hutton and Mrs. Bassett, on "Pre-frontal Leucotomy—Effect on Creative Personality," and Dr. R. Sessions Hodge and Mr. Y. Golla, on "Urethral Smears in Mental Disorder," will be read. Prof. F. L. Golla will give a demonstration of simultaneous recording of speech and emotional reaction in pre-frontal leucotomy and other cases. At 2.15 p.m. there will be a demonstration of apparatus, including electro-toposcopy, at Barnwood House by Dr. W. Gray Walter, followed by a paper on "Brain Metabolism" by Dr. W. R. Ashby and a discussion on "Electric Convulsion Therapy," to be opened by Prof. Golla.

The opening ceremony of Barnett Hill Red Cross House, Wonersh, Guildford, Surrey, as the national training centre for British Red Cross Society officers will be performed by the Princess Royal on Friday, May 16, at 3 p.m.

Dr. Gordon E. Richards (Toronto) will deliver the Skinner Lecture before the Faculty of Radiologists at the Royal College of Surgeons of England, Lincoln's Inn Fields, London, W.C., on Friday, May 16, at 2.30 p.m. His subject is: "The Place of Surgery and of Radiotherapy in the Management of Mammary Cancer—A Study of some of the Factors which determine Success or Failure in Treatment." The lecture is open to all members of the medical profession.

A meeting of the Tuberculosis Association will be held at 26, Portland Place, London, W., on Friday, May 16, at 3.30 p.m., when papers will be read by Dr. W. Santon Gilmour, on "Tuberculosis in China," and by Dr. Marc Daniels, on "U.N.R.R.A. and Tuberculosis in Europe."

The annual meeting of the Ophthalmological Society of Australia will be held in Sydney in the first week of September. A cordial invitation is extended to doctors in this country.

Prof. A. J. Ballantyne, Emeritus Professor of Ophthalmology at Glasgow University, received the degree of Doctor of Science from the University of Rowanoke, Salem, Virginia, U.S.A., on April 9.

The Edinburgh University Senate has awarded the Cameron prize in therapeutics for 1947 to Prof. Hamilton Fairley.

Dr. Ivor Campbell, for a number of years medical superintendent of the West Highland Cottage Hospital, Oban, was the recipient of a gold pocket watch and a cheque on March 5, in recognition of the great services he had rendered to the hospital, and the matron and staff presented him with a set of silver-backed brushes and comb.

A deputation of the British Legion led by Brig.-Gen. Sir Richard Fitzpatrick drew the attention of the Minister of Health on April 14 to the necessity for hospital facilities for the intensive treatment of rheumatism. The deputation urged that units similar to the British Legion Unit of Rheumatology which was established at the Three Counties Emergency Hospital, Arlesey, Beds., in June last year be set up in selected hospitals throughout the country. The Minister of Health replied that he would encourage the provision of more similar units, and announced that the existing unit would be transferred complete to the Royal Free Hospital.

The Edinburgh Clinical Club has renewed its activities (in abeyance during the war) with a winter series of papers and clinical meetings of special value to general practitioners. Prof. Stanley Davidson read a paper on folic acid on March 26 at the last meeting of a successful session. At the annual business meeting Dr. A. Murray Marr was elected to succeed Dr. John Young as chairman for next session.

The increased tax on tobacco will involve the West Riding Mental Hospital Board in an additional expenditure of £12,981 12s. to supply tobacco to patients in its hospitals. Last year male patients received a minimum of 1 oz. a week and female patients 1/2 oz. at a cost of £26,607 4s.

A committee has been formed under the chairmanship of Lord Horder in order to launch an appeal for a memorial to Tudor Edwards. The members of the committee are: Lord Dudley, Chairman, Board of Governors, Brompton Hospital; Lord Courtauld Thomson, Chairman, King Edward VII Sanatorium, Midhurst; Sir Max Page, Council, Royal College of Surgeons; Sir Stanford Cade, Westminster Hospital; Dr. R. A. Young, Middlesex Hospital; Dr. Geoffrey Marshall, Brompton Hospital; Dr. T. Jenner Hoskin, Royal Free Hospital; Dr. Ivan Magill, Westminster Hospital; Dr. Horace Evans, The London Hospital; Dr. Geoffrey Todd, King Edward VII Sanatorium, Midhurst; Dr. D. T. Davies, Royal Free Hospital; Hon. Secretaries, Mr. C. Price Thomas, Brompton Hospital; Mr. F. G. Rouvray, House Governor, Brompton Hospital. The appeal will be made soon, when the details of its object will be fully stated.

EPIDEMIOLOGICAL NOTES

Smallpox

After nearly a fortnight's interval a further case of smallpox has been reported from Bilston (Staffs). The patient, an unvaccinated labourer aged 69, was taken ill on April 25. A rash developed on April 29 and he was removed to hospital on May 1, where he died the following day. Laboratory tests were positive for variola. This patient was not a contact of any known previous case.

No further cases have been reported from Scunthorpe, Lincs.

Discussion of Table

In *England and Wales* the only infectious disease with an increased incidence was whooping-cough with a rise of 366. A fall in incidence was recorded for measles 1,291, diphtheria 31, and dysentery 31.

The rise in the notifications of whooping-cough was general throughout the country; the largest increase was Lancashire 86. Measles was less prevalent in most counties; the greatest decreases were Yorkshire West Riding 291, Leicestershire 173, Warwickshire 158, Middlesex 122, and Derbyshire 109. The only change of any size in the local trends of diphtheria was a decrease of 14 in Lincolnshire. No notable changes occurred in the local returns of scarlet fever. A further 13 cases of dysentery were notified in Surrey, where 25 cases were reported in the preceding week.

In *Scotland* there was an increase in the incidence of whooping-cough 253 and measles 73, while a decrease was reported for scarlet fever 51 and cerebrospinal fever 17. The rise in cases of whooping-cough and measles was contributed by Glasgow and Greenock. The decrease in the returns of scarlet fever and cerebrospinal fever was fairly general throughout the country.

In *Eire* the notifications of whooping-cough fell by 21, and of diarrhoea and enteritis by 10 in Dublin C.B. Small increases were recorded in the notifications of scarlet fever 8 and diphtheria 4.

In *Northern Ireland* the incidence of measles continued to decline. Only 18 cases were reported from Belfast C.B. during the week.

Week Ending April 26

The notifications of infectious diseases in England and Wales during the week included: scarlet fever 892, whooping-cough 2,044, diphtheria 175, measles 7,962, acute pneumonia 647, cerebrospinal fever 64, dysentery 61, paratyphoid 1, typhoid 6.

No. 16

INFECTIOUS DISEASES AND VITAL STATISTICS

We print below a summary of Infectious Diseases and Vital Statistics in the British Isles during the week ended April 19.

Figures of Principal Notifiable Diseases for the week and those for the corresponding week last year, for: (a) England and Wales (London included). (b) London (administrative county). (c) Scotland. (d) Eire. (e) Northern Ireland.

Figures of Births and Deaths, and of Deaths recorded under each infectious disease, are for: (a) The 126 great towns in England and Wales (including London). (b) London (administrative county). (c) The 16 principal towns in Scotland. (d) The 13 principal towns in Eire. (e) The 10 principal towns in Northern Ireland.

A dash — denotes no cases; a blank space denotes disease not notifiable or no return available.

Disease	1947 (a)	(b)	(c)	(d)	(e)	1946 (Corresponding Week) (a)	(b)	(c)	(d)	(e)
Cerebrospinal fever	81	5	19	1	—	64	11	29	2	1
Deaths		3	1				—	2		
Diphtheria	182	24	59	22	9	415	27	80	39	10
Deaths	1	—	1	—	—	5	1	2	—	—
Dysentery	46	4	16	—	—	189	22	60	—	—
Deaths				—	—				—	—
Encephalitis lethargica, acute	2	—	1	—	—	1	—	1	—	—
Deaths		—					—			
Erysipelas			36	1	1		2	38	6	1
Deaths		—								
Infective enteritis or diarrhoea under 2 years				28					22	
Deaths	84	11	16	7	1	45	6	5	7	3
Measles*	9,035	490	296	44	18	2,392	935	459	39	1
Deaths	20	3	—	2	2	1	1	4	—	—
Ophthalmia neonatorum	64	8	10	—	—	60	7	10	—	—
Deaths										
Paratyphoid fever	5	1	—	—	—	9	—	—	1 (B)	—
Deaths	—	—	—		—	—	—	—	—	—
Pneumonia, influenzal	728	39	4	16	2	652	50	4	6	4
Deaths (from influenza)†	16	3	3	—	—	28	4	—	3	1
Pneumonia, primary			252	30				137	11	
Deaths		36		9	9		25		10	13
Polio-encephalitis, acute	1	—				—	—			
Deaths		—					—			
Poliomyelitis, acute	9	—	2	6	—	5	1	3	1	1
Deaths		—					—			
Puerperal fever		—	10		—		3	5		—
Deaths										
Puerperal pyrexia‡	139	6	12	3	3	107	8	5	—	—
Deaths		—					1			
Relapsing fever	—	—			—	—	—			—
Deaths										
Scarlet fever	930	73	126	26	33	1,051	84	128	12	40
Deaths	—	—	—	—	—	—	—	—	—	—
Smallpox	2	—	—	—	—	3	1	—	—	—
Deaths				—	—				—	—
Typhoid fever	5	1	1	4	—	3	—	—	1	—
Deaths	—	—	—	—	—	—	—	—	—	—
Typhus fever	—	—	—	—	—	—	—	—	—	—
Deaths				—	—				—	—
Whooping-cough*	2,117	255	399	88	13	1,607	176	91	25	12
Deaths	16	1	6	8	4	8	—	—	1	1
Deaths (0–1 year)	528	76	82	34	20	382	51	47	39	12
Infant mortality rate (per 1,000 live births)										
Deaths (excluding still-births)	5,270	816	688	246	169	4,588	652	570	199	136
Annual death rate (per 1,000 persons living)			14·3	15·8				12·5	12·7	
Live births	10,532	1662	1233	492	318	7,036	997	917	413	271
Annual rate per 1,000 persons living			24·8	31·5				18·4	26·5	
Stillbirths	276	41	31			247	30	28		
Rate per 1,000 total births (including stillborn)			25					30		

* Measles and whooping-cough are not notifiable in Scotland, and the returns are therefore an approximation only.

† Includes primary form for England and Wales, London (administrative county), and Northern Ireland.

‡ Includes puerperal fever for England and Wales and Eire.

Any Questions ?

Correspondents should give their names and addresses (not for publication) and include all relevant details in their questions, which should be typed. We publish here a selection of those questions and answers which seem to be of general interest.

Serum Phosphatase and Cancer of Prostate

Q.—*What is the significance of the blood phosphatase estimation in carcinoma of the prostate, and is there any difference between the acid and the alkaline phosphatase estimations ?*

A.—It has been found that the serum phosphatase, which has a maximum activity at *p*H 5 (acid serum phosphatase), is noticeably increased in carcinoma of the prostate, more especially when bony metastases are present. Acid phosphatase is also increased in the cells of the primary prostatic lesion. After castration the serum acid phosphatase undergoes a sharp reduction towards the normal. The serum acid tests may therefore be helpful in diagnosis and, when the patient is taking stilboestrol, also of use in regulating treatment. The alkaline phosphatase is of little importance in this connexion. It is difficult to give a figure at which the rise in acid phosphatase becomes significant, as the normal level is different in different patients.

Tapping a Hydrocele

Q.—*A patient with a hydrocele is not in a fit condition to stand operation. Can you give the formula now in use for injection after tapping, and the technique employed in the obliteration of the sac ? Does much discomfort or pain accompany this procedure ?*

A.—Authorities are not all agreed as to the advisability of treating hydroceles by aspiration and the injection of irritant fluid. This treatment is more likely to be successful when the hydrocele is thin-walled and of only moderate size. Recurrences take place in about 10% of cases. The hydrocele is first tapped in the usual manner, and when the last drops of fluid have been expressed a syringe containing the irritant fluid is applied to the cannula. The fluid is then injected and the sac manipulated. Part or all of the fluid is allowed to drain away and the cannula is withdrawn. The following solutions have been used: sodium morrhuate (5 ml. of a 5% solution); carbolic acid (1 drachm (4 g.) of crystalline carbolic acid kept liquid with the addition of 10% of glycerin); and tincture of iodine. The patient should be kept in bed for twenty-four hours and afterwards on a couch for several days. The reaction may be fairly severe, and for this reason repeated tapping as an alternative to open operation is to be preferred.

Threadworms

Q.—*My children, aged 5 and 2, have had threadworms for the last six months. I have treated them with quassia enemata, carbon tetrachloride, and gentian violet, and also taken the usual precautions against reinfection, but there is no permanent improvement. Can anything further be done ?*

A.—The question of a symptomless adult carrier in the family circle should be considered. In rare instances the appendix may be packed with threadworms, and any suspicious symptom or sign of appendicular trouble should be considered as an indication for surgery. The use of a rhubarb and sodi. bicarb. mixture over a period is old-fashioned but sometimes very effective in helping the bowel to "throw off" the infection.

Quinine and Otitis Media

Q.—*Is there any scientific justification for the view that quinine in the usual antimalarial dosage is contraindicated in those subject to otitis media, because of the risk of further impairment of hearing ?*

A.—Otitis media in itself is not a contraindication to quinine in the usual antimalarial dosage. The unpleasant but transitory aural effects of quinine may, however, be obviated by using one of the new synthetic antimalarial drugs, which at the same time are more satisfactory than quinine in malaria.

Amoebiasis and Appendicitis

Q.—*Does caecal amoebiasis ever relapse because the infection has been carried on in the appendix ? I suggest that even the most thorough treatment with retention enemata and E.B.I. is unlikely to clear a submucosal ulcer, possibly protected by debris, in the appendix. Would appendicectomy be the correct procedure after a flare-up has been dealt with in the absence of the usual signs of chronic appendicitis ?*

A.—Amoebic infection is unlikely to be confined to the appendix and therefore cannot be considered as the sole source of relapsing infection in the caecum. There is evidence that emetine bismuth iodide is absorbed and does not owe its therapeutic effect solely to surface action; consequently submucosal ulcers respond to standard treatment. Where there is much secondary infection, courses of penicillin and sulphonamides associated with specific amoebicidal drugs may assist in cure. Appendicectomy is not indicated after the treatment of amoebiasis in the absence of evidence of appendicitis. Amoebic typhlitis often simulates chronic appendicitis, but the manifestations rapidly resolve under amoebicidal treatment.

Effect of Chromic Acid on Teeth

Q.—*Has chromic acid any deleterious effect on the enamel of the teeth ?*

A.—Chromic acid used over a long period can cause staining of the necks of the teeth, followed by some degree of decalcification if the applications are continued long enough. Ulcers of the mucous membrane may also be initiated by careless or over-prolonged administration.

Treatment of Arthritis

Q.—*What are the indications for gold therapy in rheumatoid arthritis ? Is short-wave diathermy of value in the treatment of osteoarthritis of the hip ?*

A.—To discuss the indications for gold therapy in rheumatoid arthritis would entail a lengthy article; a modern textbook of the rheumatic diseases should therefore be consulted. Practical experience both of the disease and of the remedy is, however, the only safe guide, and close observation of the effect of each dose, including examinations of the urine and blood, is essential. An accelerated erythrocyte sedimentation rate and other evidences that the disease is active are the primary indications for gold therapy. The dose should not exceed 0.05 ml. of sodium aurothiomalate, or its equivalent, at intervals of five to seven days. Modern practice is to continue along these lines for fifteen to twenty doses and then to give a small maintenance dose at a longer interval: 0.05 ml. once a month would be appropriate, so long as there are no signs of toxicity—albuminuria, skin rashes, stomatitis, leucopenia, etc.

Short-wave diathermy often relieves the pain of osteoarthritis of the hip, but care should be taken to ensure that it is properly focused on the joint. Overdosage must be avoided.

Furunculosis

Q.—*Can furunculosis be prevented from spreading (a) in the axilla and (b) on the hairy forearm ?*

A.—In the absence of any underlying general cause of lowered resistance, or any local source of infection such as oral sepsis, the spread of furunculosis is commonly due to external irritant factors, for example, friction, chemicals, including oil or tar, and unsuitable and especially greasy or macerating local applications. The objective should be to keep the parts dry, to use dry heat or short-wave diathermy, and local antiseptics that are non-irritant. *X*-ray therapy is of value, especially in localized furunculosis. Sulphonamides may be given by mouth and penicillin parenterally, but they should not be employed locally.

In furunculosis of the axilla, *x*-ray therapy (150 *r*, unfiltered, at 80 kV, repeated every month for three treatments) may be

recommended in conjunction with treatment along the lines indicated above and with dyes or calamine lotion applied locally. On the hairy forearms the same principles apply. Autogenous vaccines have also been recommended; non-specific shock therapy is often of value, as are whole-blood injections (10 ml. weekly).

Histamine-sensitivity

Q.—*How should I test for histamine-sensitivity? How is desensitization effected particularly in relation to the treatment of Ménière's syndrome in histamine-sensitive patients?*

A.—To test for histamine-sensitivity inject into the skin of the forearm 0.05 ml. of a 1 in 10,000 solution of histamine, calculated in terms of histamine base. Sensitive patients will react with an urticarial weal almost an inch (2.5 cm.) in diameter, having one or more pseudopodia, 1 inch in length, with a surrounding erythema of 2 inches (5 cm.) or more. In the non-sensitive patient the urticarial weal will be about 1/3 inch (0.8 cm.) in diameter, will have either no pseudopodia or at the most very small buds, and the erythema will be about an inch in diameter. If in doubt test again with double the dose a few days later. If no pseudopodia appear, then the case is not histamine-sensitive.

Histamine-sensitive patients should be treated with gradually increasing doses of histamine given subcutaneously. The following is a suggested scheme of dosage: starting with a 1 in 10,000 solution, 0.05 ml., 0.1 ml., 0.2 ml., 0.3 ml., and so on up to 0.8 ml.; then with a 1 in 1,000 solution, 0.1 ml., 0.2 ml., up to 0.8 ml.; then with a 1 in 100 solution, 0.1 ml. and so on up to a maximum dose of 1 mg., or until symptoms of overdose occur, which is not infrequent at a dose of 0.4 to 0.5 mg. The injections are given twice a week until the maximum, or the maximum without symptoms, is reached, after which this dose is maintained weekly for two months (M. Atkinson, *J. Amer. med. Ass.*, 1941, **116**, 1753; *Proc. roy. Soc. Med.*, 1946, **39**, 807). The intravenous administration of histamine, 1 mg. of histamine base in 250 ml. of saline, given over at least one and a half hours, is recommended by Horton for the relief of an acute attack of Ménière's syndrome, and is especially indicated for those who have acute loss of hearing. (B. T. Horton, *Surg. Gynec. Obstet.*, 1941, **72**, 417; C. H. Sheldon and B. T. Horton, *Proc. Mayo Clin.*, 1941, **15**, 17).

INCOME TAX

All inquiries will receive an authoritative reply but only a selection can be published.

Living-out Allowances

S. E. inquires whether payment at £100 per annum made as a living-out allowance because there is no residential accommodation in the hospital is liable to income tax.

*** Yes—it is liable. The official who makes the payments is responsible for deducting tax under the Pay-as-you-earn scheme. It is, of course, true that a medical officer living in is not liable on the value of that benefit, but when living out he falls into the general class of employees and as such must bear the cost of living out of his taxed income.

"Family Allowances" and "Wife's Earned Income"

"FATHER" writes—"Family allowance is considered by my Inspector of Taxes to be a part of the earned income of the husband. Should not the allowance legally be considered as a part of the earned income of the wife, and thus, in many cases, be covered by the wife's earned income allowance?"

*** No. The point is covered by Sec. 27 (2) of the Finance Act, 1946, which provides that "payments of benefit under the National Insurance Act, other than maternity grant and death grant, shall be charged to income tax under Schedule E" and further that "no such payment shall be treated by virtue of this subsection as earned income for the purpose of Sec. 18 (2) of the Finance Act, 1920 (which provides, in the case of married persons, for an increased personal allowance by reference to the wife's earned income), unless it is payable by way of unemployment benefit, sickness benefit, or maternity allowance."

This statutory rule is clearly one which was deliberately adopted by Parliament and an attempt to abrogate it would be very unlikely to succeed.

Letters and Notes

Car Sickness in Children

Dr. A. H. MOSELEY (Warrawee, New South Wales) writes: There was a question about car sickness in children (Nov. 30, 1946, p. 842). The following simple treatment has been satisfactory with three small children. It was used by the old coach-drivers to keep out the cold. A sheet of brown paper under the shirt and coming well up to the base of the neck, and over the abdomen.

Massive Doses of Penicillin

Dr. J. C. JONES (London, S.E.25) writes: With reference to the reply under "Any Questions?" on Nov. 30, 1946 (p. 842), during the recent measles epidemic I have given 250,000 units of penicillin (calc. suspension), and even 375,000 units, to children who developed otitis—children mostly of 5 years or less—which completely cleared up the attacks within 24 hours. In two or three cases at the most has the injection had to be repeated. At the same time or immediately following the penicillin a four-days course of "uleron" (crushed tablets in syr. tolu.) to prevent recurrence of the otitis was given. Points of importance are: It is necessary to use a very wide-bore needle, so that skin anaesthesia (ethyl chloride freezing) is advisable. It is necessary to cover the point of injection with "elastoplast" made more sticky by spraying with ethyl chloride. It is advisable to inject into the upper lateral sections of the buttocks, otherwise the oily suspension of penicillin will leak out and the effect be lost. The only complication I had was with a child suffering not from otitis but from meningitis. This child was given "uleron" followed after 2 days with several large doses of penicillin. She cleared up in about a week but broke out into a universal vesicular skin rash in which the vesicles ran together into confluent patches. This looked terribly distressing but the patient did not worry much about it, and it cleared quite up without attention except for large doses of "calfos."

Lymphoedema of the Legs

Dr. FREDERICK SUTTON (Clifton, Bristol) writes: Your contributor (March 22, p. 402) makes no mention of chronic postural oedema in women, which is a common cause of this condition. So little is said about it in textbooks that one not infrequently sees girls or young women who have been sent by doctors to the out-patient clinic as "obscure oedema." In many there is an obvious peripheral circulatory anomaly such as erythrocyanosis, the lower part of the legs being cold and blue and even showing trophic ulcers at times, especially during the colder months of the year. Some patients, however, show only a rather hard lymphatic type of swelling, often affecting only one leg. In the majority of them there is no previous history of thrombophlebitis, or other inflammatory reaction, and careful inquiry suggests that it has developed gradually over a period of time. Very rarely one meets with periodic streptococcal lymphangitis in such cases, which arises because of the circulatory dysfunction and which rapidly subsided with rest in bed and salicylates before the days of modern therapy. At the time of the attack the classical signs of inflammation appear and, in a few, ague-like chills with fever occur for the time being. Treatment is very unsatisfactory, though the very severe cyanotic cases may be helped by lumbar sympathectomy. Thyroid, pituitary gland extracts, dienoestrol in large doses, and mercurial diuretics have been tried with some temporary success. Physical treatment, such as the wearing of an elastic stocking or fine elastic-woven bandages, and such measures as massage, diathermy, and especially the daily use of the pulsator are helpful, and, moreover, unless they are employed the ankle region gradually becomes more swollen.

Correction

In the answer to a question about "faecal *B. coli*" (May 3, p. 625) the statement, "therefore many *B. coli* occur which are not faecal; those which are not faecal are widely distributed as animal parasites," is incorrect. It should have read: "therefore many *B. coli* occur which are not faecal; those organisms which *are* faecal are widely distributed as animal parasites."

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